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PLANTS OF THE CAMBRIDGE EXPEDITION, 1947-1948 : III.*

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VIOLACEAE, EUPHORBIACEAE, ROSACEAE, MORACEAE, SAPINDACEAE, APOCYNACEAE, COMMELINACEAE, MARANTACEAE.

This paper is an account of new or noteworthy plants of the above families in the general collections made in Nigeria and the British Cameroons by the Cambridge Botanical Expedition, 1947–48.

The abbreviations used for herbaria to which specimens have been or will be sent are given in a list in Kew Bull. 1952, p.228, with the addition : EA=Nairobi (East African Herbarium).

I must thank Mr. E. Milne-Redhead for kindly naming and writing a note on *Marantochloa mannii*.

VIOLACEAE

Rinorea ilicifolia (*Welw. ex Oliv.*) *O. Ktze.* ; Hutch. et Dalz., Fl. W. Trop. Afr. **1,** 93, 94 (1927).

Benin Province, Benin Division. In deep shade among tall trees in dried-up stream-bed about 4·5 km. S. of Nikrowa Rest-House, Okomu Forest Reserve, 12 Dec. 1947, *J. P. M. Brenan* 8491 (K, FHI, O, P, BM) : —shrub about 1·2 m. high ; twigs green ; leaves coriaceous, deep green and glossy above, with conspicuously impressed midrib lateral nerves and venation, beneath pale green with prominent midrib and venation ; buds green. Uncommon, in deep shade of high forest near Nikrowa Rest-House, Okomu Forest Reserve, 14 Dec. 1947, *J. P. M. Brenan* 8513 (K, FHI, O) :—single-stemmed shrub to 2·1 m. high ; stems green ; leaves coriaceous, deep green and glossy above, venation very impressed, beneath pale green, with prominent venation ; calyx and corolla cream.

Distrib. Widely scattered in tropical Africa, but in the area of the Fl. W. Trop, Afr. previously known only from French Guinea, Sierra Leone and the Ivory Coast. Its presence in Nigeria thus seems worth noting.

Since writing the above, I have been informed by my friend, Mr.

*Continued from K.B. 1952, p. 236.

R. W. J. Keay, that he has collected a specimen of *R. ilicifolia* at Olokemeji (*Keay* FHI 22470) ; and that he has seen a sheet from Eket (*Talbot s.n.*) in Herb. Mus. Brit., hitherto unnamed.

Rinorea kamerunensis *Engl.* ; Hutch. et Dalz., Fl. W. Trop. Afr. **1,** 93, 95 (1927).

British Cameroons, Kumba Division. Rare in undergrowth of high forest, Banga, S. Bakundu Forest Reserve, 12 Mar. 1948, *J. P. M. Brenan* 9289 (K, FHI, B) :—erect single-stemmed simple or sparsely branched shrub about 1·2 m. high ; young stems green, older blackish-brown ; leaves subcoriaceous, deep green and not very glossy above, pale glaucescent green beneath ; inflorescences all axillary, axes green ; flowers nodding ; sepals yellowish ; petals white. Near Banga, 18 Mar. 1948, *J. P. M. Brenan* 9289A (K). Victoria Division. About 4·5 km. S. of Banga, 20 Mar. 1948, *J. P. M. Brenan* 9289B (K, FHI, O, P).

R. kamerunensis was recorded in the Fl. W. Trop. Afr. on the strength of a specimen from the British Cameroons—*Preuss* 1221—which the authors had not seen. Therefore the re-collection of this rare species in the same territory is both interesting and welcome.

In the key to the species in Fl. W. Trop. Afr. (p. 93) *R. kamerunensis* is compared with *R. elliotii*, but one very striking and easily seen character that distinguishes the former not only from *R. elliotii* but from the majority of the West African Rinoreas is strangely unmentioned. In *R. kamerunensis* the inflorescences are all or mostly axillary, arising from the axils of full-sized leaves (sometimes a terminal inflorescence is present *in addition to* the axillary ones) ; while in *R. elliotii* the inflorescence is terminal, with only occasionally a subsidiary axillary branch beneath.

Rinorea adnata *Chipp* in Kew Bull. **1923,** 291, 295 (1923) ; Melchior in Engl. et Prantl, Nat. Pflanzenfam., ed. 2, **21,** 351 (1925).

British Cameroons, Kumba Division. Frequent in undergrowth of high forest, Banga, S. Bakundu Forest Reserve, 10 Mar. 1948, *J. P. M. Brenan* 9260 (K, FHI, O, P) :—shrub about 2·1 m. high, not much branched ; twigs green, glossy ; leaves thickly papery, mid-green and not very glossy above with pale prominent midrib, pale green beneath ; inflorescence-axis green, ultimate axes pale yellowish as are the calyces and reflexed petals ; anthers whitish.

This species, new to the area of the Fl. W. Trop. Afr., was hitherto known only from the rather poor type-specimen, *Zenker* 1084, from Bipinde in the French Cameroons. This sheet shows only a single detached inflorescence, in bud. The additional material collected by the Cambridge Expedition allows the original description to be amplified in various ways :—

Leaves up to 10 cm. wide ; petiole up to 6·5 cm. long. Inflorescences few, terminal or from the upper axils, variable in length and density, sometimes dense and 4–5 cm. long, sometimes lax and up to 12 cm. long, 3–4 cm. wide, paniculate. Sepals 3 mm. long. Petals 5 mm. long, 3 mm. wide. Staminal tube lobed opposite the anthers, the tube 1·5 mm. long between the lobes, 2 mm. long at the lobes. Anthers 2·5 mm. long. Ovary very minutely puberulous.

The floral measurements (made from spirit material) are considerably larger than those given by Chipp in the original description ; in addition the character of the deficient staminal tube, used to separate *R. adnata* from *R. preussii* and *R. kamerunensis*, is here contradicted. These discrepancies are due to the inflorescence on the type-specimen being in bud ; and dissected buds from *Brenan* 9260 show the same structure, including the almost absent staminal tube, as that of the type-specimen.

R. adnata differs from *R. kamerunensis* Engl. in the leaves being non-gland-dotted beneath, and in the broader not " subspicate " inflorescences which are commonly terminal and not profusely axillary ; from *R. longicuspis* Engl. in the non-gland-dotted leaves, and in the very minutely puberulous not densely pilose ovary ; and from *R. gabunensis* Engl., to which it is perhaps closest, in the oblong leaves with glabrous not puberulous petioles and venation less close and prominent.

In the Fl. W. Trop. Afr. *R. adnata* will key down to the group of species containing *R. parviflora* Chipp, *R. oblongifolia* (C. H. Wright) Marq. ex Chipp and *R. preussii* Engl. From the first *adnata* differs in non-glandular leaves (*R. parviflora* is misplaced in the Flora, having distinctly gland-dotted leaves) ; from the second *adnata* differs in having no free margin to the staminal tube ; from the third, to which again it is extremely close, it differs in the oblong leaves, predominantly terminal inflorescences, and the larger appendage to the anther-thecae.

Rinorea longisepala *Engl.* in Engl., Bot. Jahrb. **33,** 143 (1902) ; M. Brandt in Engl., Bot. Jahrb. **50** (suppl.) 414 (1914) ; De Wild. in Bull. Jard. Bot. Brux. **6,** 145, 172 (1920) ; Engl., Pflanzenw. Afr. **3** (**2**), 551 (1921) ; Melchior in Engl. et Prantl, Nat. Pflanzenfam., ed. 2, **21,** 351 (1925).

Calabar Province, Calabar Division. In shade of rain-forest on gentle slope above the Kwa River near the Falls, rare, 6 Mar. 1948, *J. P. M. Brenan* 9229 (K, FHI, O, P, BM, CA) :—shrub about 2 m. high ; twigs dark grey-brown ; leaves stiffly papery to subcoriaceous, deep green and glossy above with impressed midrib lateral nerves and venation, pale green beneath ; inflorescence-axes dull purple ; sepals green, dull purplish towards base.

Distrib. French Cameroons and Spanish Guinea. New to Nigeria and the area of the Fl. W. Trop. Afr.

R. longisepala keys down in the Flora to near *R. oblanceolata* Chipp, from which, and indeed all the other species, it is abundantly different in the densely pubescent stems and midribs and lateral nerves on the lower side of the leaves, the large persistent stipules, the very densely pubescent inflorescence-axes, and above all the very large lanceolate sepals 5–8 mm. long.

Mr. R. W. J. Keay informs me that he has seen a specimen of this, hitherto unnamed, in Herb. Mus. Brit. from Oban (*Talbot* 455).

Rinorea ledermannii *Engl. apud M. Brandt* in Engl., Bot. Jahrb. **51,** 121 (1913), *e descr.* ; M. Brandt in Engl., Bot. Jahrb. **50** (suppl.) 416 (1914) ; De Wild. in Bull. Jard. Bot. Brux. **6,** 146, 172 (1920); Engl., Pflanzenw. Afr. **3** (**2**), 552 (1921).

British Cameroons, Kumba Division. Rare in deep shade on side of stream-gulley, Banga, S. Bakundu Forest Reserve, 11 Mar. 1948, *J. P. M. Brenan* 9278 (K, FHI) :—straggling much branched shrub about 1·5 m. high ; twigs blackish-brown ; leaves subcoriaceous, deep green and glossy above, midrib and lateral nerves very impressed, pale green beneath ; inflorescences very short, axes and pedicels red-purple ; buds reddish-purple ; sepals yellow with red-purple tinge ; petals yellow. Occasional in high forest, Banga, S. Bakundu Forest Reserve, 12 Mar. 1948, *J. P. M. Brenan* 9290 (K, FHI, O, P, BM, CA, B) :—arborescent shrub about 3 m. high ; twigs blackish-brown ; leaves subcoriaceous, mid-green and not very glossy above, pale green beneath with minute orange glands ; inflorescence-axis red-purple ; flowers nodding ; sepals purplish- or pinkish-yellow ; petals yellow.

Distrib. Previously known only from the type-gathering made in the French Cameroons (*Ledermann* 760), now presumably destroyed.

This species has not hitherto been represented at Kew, and the identification is therefore *e descr.* However, the specimens collected by the Cambridge Botanical Expedition agree so well with the description of this remarkable species that I have no doubt of the identity.

The affinity of *R. ledermannii* is obviously with *R. oblanceolata* Chipp, and it is a very close one. The lower surface of the leaves is glandular in *R. ledermannii*, eglandular in *R. oblanceolata* ; the leaf-base of *R. ledermannii* is more markedly auricled, broader and amplexicaul ; and the peduncles shorter—up to about 3 cm. long—as against about 4–7 cm. in *R. oblanceolata*. In addition the flowers of *R. ledermannii* appear to be rather larger, with the sepals about 4 mm. long and the petals about 6 mm. long.

EUPHORBIACEAE

Drypetes capillipes (*Pax*) *Pax et K. Hoffm.* in Engl., Pflanzenr. **4. 147. 15,** 260 (1922).

Lingelsheimia capillipes Pax in Engl., Bot. Jahrb. **43,** 318. 1909 ; in Mildbraed, Wiss. Ergebn. Deutsch. Centralafr. Exped. **2,** 447, t.55 (1912) ; Hutch. in Thiselton-Dyer, Fl. Trop. Afr. **6** (**1**), 691 (1912) ; Pax in Engl. Pflanzenw. Afr. **3** (**2**), 35 (1921).

Ijebu Province, Ijebu Division. About 6·5 km. E. of 18 Grace Camp, Fowa towards Ajebandele, 25 Mar. 1946, *A. P. D. Jones and C. F. Onochie in Forest Herbarium, Ibadan*, 17205 (K, FHI) :—in broken forest with Opepe and *Erythrophleum* as emergents and abundant regeneration of *Sterculia rhinopetala* ; small understorey shrub to 3 m. high. Benin Province, Benin Division. Common in deep shade on slope near stream in high forest, but not seen elsewhere, near Nikrowa Rest-House, Okomu Forest Reserve, 8 Dec. 1947, *J. P. M. Brenan* 8403 (K, FHI, O, P, BM, CA) :—single-stemmed shrub up to 1·9 m. high with numerous widely ascending lateral branches ; twigs green then going grey ; leaves papery, deep green and glossy above with impressed midrib and lateral nerves ; pedicels long, slender, green, drooping ; perianth greenish-white ; stamen-filaments white ; anthers cream. In broken high forest near Nikrowa Rest-House, Okomu Forest Reserve, 8 Dec. 1947, *J. P. M. Brenan* 8411 (K, FHI, O, P, BM, CA, B) :—small tree

about 3·6 m. high with arching branches at apex ; stem about 5 cm. in diameter, grey-barked ; vegetative characters as in 8403 ; fruiting pedicels slender, green, drooping ; fruits hard, ellipsoid, green. Seedlings of 8411, collected under the tree, 8 Dec. 1947, *J. P. M. Brenan* 8412 (K, FHI, O, P, BM, CA) : hypocotyl grey ; cotyledons mid-green and glossy above with somewhat impressed nerves, slightly paler beneath with prominent nerves ; foliage as in mature tree but thinner ; these seedlings differ from those of 8413 [*Drypetes chevalieri* Beille ex Hutch. et Dalz.] in their shorter blunter cotyledons, less oblique leaf-bases, and short curled hair on young stems. In shade of high forest not far from gulley near Nikrowa Rest-House, Okomu Forest Reserve, 10 Dec. 1947, *J. P. M. Brenan* 8466 (K, FHI, O, P, BM) :—same as 8411, showing mature fruits which are ellipsoid or broadly ellipsoid, orange, and rather hard. In high forest near stream-gulley, Compartment 55, Okomu Forest Reserve, 8 Jan. 1948, *J. P. M. Brenan & Dr. E. W. Jones* 8751 (K, FHI, O) :—common here, not seen elsewhere ; shrub about 4·5 m. high ; pedicels slender, drooping, green ; perianth yellowish ; ovary greenish-yellow, on a flattened disc ; stigmas apparently dark.

Distrib. New to Nigeria and the area of the Fl. W. Trop. Afr. ; previously known from the Belgian Congo and French Cameroons.

D. capillipes is immediately distinguished from all the other species of *Drypetes* in West Africa by the flowers on long, slender, drooping pedicels 4–10 cm. long, one or two together in the axils of the leaves. If the genus *Lingelsheimia* Pax is kept up in the sense of the Fl. W. Trop. Afr., then this is certainly one, as is *D. chevalieri* Beille ex Hutch. et Dalz. ; but while these species have with others a common facies, the deep lobing of the disc, with the stamens apparently inserted within the disc, is found in other species of *Drypetes* lacking this facies, e.g. *D. molunduana* Pax et K. Hoffm. ; further, there are various degrees of lobing of the disc. The type-species of *Lingelsheimia, L. frutescens* Pax, has not at all the facies of a *Drypetes* and may well be a validly distinct genus. I therefore follow the conception of Pax and K. Hoffmann in Das Pflanzenreich rather than that of the Fl. W. Trop. Afr., restricting for the present *Lingelsheimia* to *L. frutescens* alone, and removing to *Drypetes* the species subsequently added to *Lingelsheimia.*

In Okomu Forest Reserve *D. capillipes*, while in no way a swamp-forest species, was very strictly confined to the gentle slopes near stream-gullies, an ecological preference shown by several other species.

Drypetes gossweileri *S. Moore* in Journ. Bot. **58,** 271 (1920).

Drypetes armoracia Pax et K. Hoffm. in Engl., Pflanzenr. **4. 147. 15,** 275 (1922) ; Pax et K. Hoffm. in Engl. et Prantl, Nat. Pflanzenfam. ed. 2, **19c,** 73 (1931) ; Dalziel, Useful Pl. W. Trop. Afr. 140 (1937) ; E. Guinea Lopez, Ensayo Geobot. Guin. Cont. Espan. 308 (1946).

Drypetes arinozacia Pax et Hoffm. (sphalm.) ; Kennedy, For. Fl. S. Nigeria, 75 (1936).

Benin Province, Benin Division. Frequent in one spot only in high forest near Nikrowa Rest-House, Okomu Forest Reserve, 8 Dec. 1947, *J. P. M. Brenan* 8419 (K, FHI, O, P, BM) :—seedlings ; hypocotyl thick, green, not glossy, with pustules and brown lenticels ; cotyledons thickly

papery, deep green and glossy above, with prominent midrib and primary nerves, somewhat paler beneath with prominent midrib and venation ; young stems green, sulcate ; leaves papery, deep green and glossy above with sunken midrib and lateral nerves, paler green beneath. Rather frequent in high forest near Nikrowa Rest-House, Okomu Forest Reserve, 11 Dec. 1947, *J. P. M. Brenan* 8474 (K, FHI, O, P, BM) :—tall tree 36 m. high ; bole 27 m. to the first branch, 2·1 m. in girth at breast-height, slightly fluted at base ; crown 7·7 m. wide ; bark grey-brown, smooth, with short raised two-lipped lenticels ; slash smelling strongly of horseradish ; outer bark 0·5 mm. thick, grey-brown, inner bark 9 mm. thick, pale brown ; wood pale orange ; young shoots green, longitudinally sulcate ; leaves when young pale yellow-green and very glossy above, when mature deep green and rather glossy above with paler not or somewhat impressed midrib and lateral nerves, paler green beneath with prominent midrib and lateral nerves, thickly papery or subcoriaceous in texture ; flower-buds large, brownish-green outside, borne singly or very few together on older twigs up to 1·4 cm. in diameter below the leaves ; sepals pale green inside, spreading ; petals greenish-cream, spreading and, like the sepals, very convex above and concave beneath ; staminodes whitish-cream ; ovary pale buff ; styles spreading, cream-coloured as are the stigmas : vernacular name (Beni) " Okhuaba ". Same habitat, locality and date as last, *J. P. M. Brenan* 8475 (K, FHI, O, P, BM, CA, B, EA, CO) :—large tree 41 m. high ; bole 29·5 m. to the first branch, girth 2 m. at breast-height ; crown 12 m. wide ; bark, slash and vegetative characters same as 8474 ; buds borne in the axils of the older leaves on shoot, or on older twigs below, fascicled up to 9 together, brownish-green outside ; sepals and petals as in 8474 ; stamen-filaments and anthers whitish ; disc cream ; rudimentary ovary cream : vernacular name (Beni) " Okhuaba ". Okomu Forest Reserve, Compartment 53, 13 Dec. 1947, *C. F. A. Onochie & J. P. M. Brenan* 8514 (K) ; tree about 30 m. high.

Distrib. Nigeria, French Cameroons, Portuguese and Belgian Congo.

D. gossweileri and *D. armoracia* are quite indistinguishable, and when Pax and K. Hoffmann published their *D. armoracia* they had evidently, perhaps due to the aftermath of war, not seen Spencer Moore's earlier description.

The meaningless epithet of *D. arinozacia* is derived from a rather feeble endeavour to decipher a badly written label on a German specimen of *D. armoracia* at Kew.

It is sad that the epithet *armoracia* cannot stand. Although from dried specimens alone its appropriateness is far from obvious, it is otherwise in the bush. The tree, and even small saplings of it, emit a most vigorous scent of horseradish : a reliable and distinctive character, with unusual and pleasing gastronomic associations.

Thecacoris leptobotrya (*Muell. Arg.*) *Brenan*, comb. nov.

Antidesma leptobotryum Muell. Arg. in Flora **47,** 529 (1864) ; Hutch. in Thiselton-Dyer, Fl. Trop. Afr. **6** (**1**), 645 (1912) ; Pax et K. Hoffm. in Engl. Pflanzenr. **4. 147. 15**, 149 (1922).

Thecacoris gymnogyne Pax in Engl., Bot. Jahrb. **28,** 20 (1899) (excl. var. *reticulata* Pax) ; Hutch. in Thiselton-Dyer, Fl. Trop. Afr. **6** (**1**), 662 (1912) ; S. Moore in Cat. Talb. Nigeria, 144 (1913) ; Pax et K. Hoffm. in Engl., Pflanzenr. **4. 147. 15,** 12 (1922).

Thecacoris klainii [sic] Pierre ex Pax et K. Hoffm. in Engl., Pflanzenr. **4. 147. 15,** 12 (1922), *pro synon.*

Thecacoris obanensis Hutch. in Hutch. et Dalz., Fl. W. Trop. Afr. **1,** 283 (1928).

Thecacoris talbotae Hutch. in Hutch. et Dalz., Fl. W. Trop. Afr. **1,** 283 (1928), excl. loc. " Ivory Coast . . ." et spec. Chev. 19502 *bis*, quod = ? *T. chevalieri* Beille.

Calabar Province, Calabar Division. Occasional in high forest, Kwa Falls, alt. about 150 m., 6 Mar. 1948, *J. P. M. Brenan* 9232 (K, FHI) :— small tree about 3·6 m. high ; young twigs green, older grey ; leaves stiffly papery, deep green and glossy above, lateral nerves impressed, paler beneath ; inflorescences drooping, with green axes ; flowers yellowish.

Antidesma leptobotryum, which provides the earliest epithet for our species, was described from male plants only ; there is no question however that the corresponding female plants are what has been usually known as *Thecacoris gymnogyne*. Male inflorescences on *Zenker* 1788, a type-number of *Thecacoris gymnogyne*, are indistinguishable from those on *Mann* 1714, the type of *Antidesma leptobotryum*. The size of the leaves, the length of their acumen, and whether they are cuneate or rounded at base, vary considerably in this species, and I am unable to maintain *T. obanensis* Hutch. or *T. talbotae* as distinct species.

As treated here *T. leptobotrya* has a distribution from Nigeria to the Gaboon, and it has been collected rather frequently, particularly in the French Cameroons. In Nigeria, like so many other interesting rain-forest species, it does not seem to occur W. of the Niger.

Caperonia latifolia *Pax apud Henriques* in Bol. Soc. Brot. **10,** 159 (1892) ; et in Engl., Bot. Jahrb. **19,** 81 (1894) ; Pax et K. Hoffm. in Engl., Pflanzenr. **4. 147. 6,** 35 (1912) ; Prain in Thiselton-Dyer, Fl. Trop. Afr. **6** (**1**), 830 (1912) ; Hutch. et Dalz., Fl. W. Trop. Afr. **1,** 298 (1928) ; Exell, Cat. Vasc. Pl. S. Tomé 297 (1944).

Benin Province, Benin Division. Abundant and dominant over considerable areas of floating vegetation in a pond in high forest, Okomu Forest Reserve, 25 Dec. 1947, *J. P. M. Brenan and Dr. E. W. Jones* 8587 (K, FHI, P, BM, CA) :—weak herb up to c. 1 m. high ; stem pale green ; stipules rigid, green ; leaves papery, mid-green above with impressed midrib and lateral nerves, pale green and glossy beneath ; flowers white ; ovaries green. Abundant in the central grassy area and spreading into outer *Crinum* zone of a seasonal marsh, open but surrounded by high forest, Okomu Forest Reserve, 15 Feb. 1948, *Dr. E. W. Jones* 9136 (K, FHI) :—herb up to 1·2 m. long, but decumbent ; flowers very scarce.

So far as Africa is concerned this rare species has been previously collected, elsewhere than on the island of S. Tomé, only once, in the British Cameroons.

Prain suggested that *C. latifolia* was an introduction from the New World, but the American specimens of *C. latifolia* that he cites differ from the African (at least from the Okomu ones) in the much longer and laxer glandular indumentum on the capsules, and I would look on the American plant as a different species.

The seeds of *C. latifolia*, hitherto unknown, are present in 8587, and they are odd and worth describing;

Semina subglobosa, 2·5 mm. diam., grisea, minute foveolata, lamellis minutis sinuosis albidis interruptis regulariter ornata, necnon linea recta unilaterali e basi ad apicem seminis percursa.

ROSACEAE

Parinari gabunensis *Engl.* in Engl., Bot. Jahrb. **17,** 87 (1893).

British Cameroons, Kumba Division. In high forest near a stream-gulley by the Banga to Kumba road, about 28 m. from Kumba, 17 Mar. 1948, *J. P. M. Brenan and C. F. A. Onochie* 9470 (K, FHI, O, P, BM, CA) :—tree probably at least 18 m. high (but crashed across road) ; bole smooth, grey, 3·6–4·5 m. in girth at breast-height, faintly fluted ; slash : outer bark 0·5 mm. thick, grey, inner bark 5 mm. thick, purplish-red with watery inner edge ; twigs green, later deep brown ; leaves coriaceous, deep green and glossy above, midrib and lateral nerves impressed, pale green and glossy beneath with prominent midrib ; flower-buds green.

In the key to *Parinari* in Fl. W. Trop. Afr. **1,** 316 (1928) this plant is liable to key down to *P. kerstingii* Engl., but is much more robust, and distinct from all the other West African species by its outsize flowers, the receptacle being 2·5–3·5 cm. long and 6–8 mm. thick towards the apex and also normally strongly bent. The calyx-lobes are about 1·2–1·3 cm. long.

Distrib. French Cameroons, Gaboon, French, Portuguese, and Belgian Congo ; now found for the first time in the British Cameroons and the area of the Fl. W. Trop. Afr.

Alchemilla kiwuënsis *Engl.* in Mildbr., Wiss. Ergebn. Deutsch. Zentr.-Afr. Exped. **2,** 225 (1911) ; T. C. E. Fries in Arkiv. för Botanik, **18,** no. 11, 40 (1923) ; for additional references and synonymy see Hauman et Balle in Rev. Zool. Bot. Afr. **24,** 308 (1934).

British Cameroons, Victoria Division. Locally frequent in more open places by path through montane forest below Liwange, Cameroon Mountain, alt. about 1980 m., 31 Mar. 1948, *J. P. M. Brenan* 9549 (K, FHI, P, BM, B) :—herb with trailing pink-purple stems radiating from base ; stipular sheaths greenish-white ; leaves mid-green above, pale green beneath ; flowers pale green.

A. kiwuënsis is a close relative of *A. cryptantha* Steud. ex A. Rich., differing in the leaves being lobed to below the middle, the teeth extending round the apex and well down the sides. *A. tenuicaulis* Hook. f. is considered by Hauman, Balle and evidently Rothmaler as a synonym of *A. cryptantha.* Whether the specimen (*Preuss* 807) from the Cameroon Mountain described by Hutchinson and Dalziel in Fl. W. Trop. Afr. **1,** 314 (1928) as

A. cryptantha is really that species or (as seems just possible from the description) *A. kiwuënsis*, I cannot tell, as the specimen is not at Kew.

Distrib. of *A. kiwuensis*. Uganda, Kenya, Tanganyika Territory, Ruanda and Belgian Congo ; the above is the first record of its occurrence in West Tropical Africa.

MORACEAE

Scyphosyce manniana *Baill.* in Adansonia **11,** 293 (1875) ; Engl., Monogr. Afr. Pfl.-Fam. u. -Gatt. **1,** 30 (1898) ; Hutch. in Prain, Fl. Trop. Afr. **6** (**2**), 220 (1917).

Cyathanthus zenkeri Engl. in Engl. et Prantl, Nat. Pflanzenfam., Nachtr. 120 (1897).

Scyphosyce zenkeri (Engl.) Engl., Monogr. Afr. Pfl.-Fam. u. -Gatt. **1,** 31, t.10 (1898).

Benin Province, Benin Division. Okomu Forest Reserve, Compartment 86, clearing in high forest, 20 Jan. 1948, *Dr. P. W. Richards & J. P. M. Brenan* 8865 (K, FHI, P) :—stems deep grey-brown ; leaves thinly but rather stiffly papery, deep green and glossy above, midrib and lateral nerves very impressed, pale green beneath, midrib and lateral nerves very prominent ; stipules brown.

Distrib. Gaboon and French Cameroons ; new to Nigeria and the area of the Fl. W. Trop. Afr.

This little plant, attaining a height of about 30 cm., is a member of that mixed and perplexing collection of tree-seedlings, frustrated epiphytes, and genuine herbs that grows on the floor of high forest. I failed to find this plant in bloom, but the leaf-shape is so singular that I have no fear of confusion.

It differs very greatly from *S. pandurata* Hutch. in its obovate or oblanceolate but not at all panduriform leaves, narrowly but very clearly asymmetrically auriculate at base, and lacking the strongly thickened leaf-margins of *S. pandurata*.

SAPINDACEAE

Allophylus megaphyllus [" megaphylla "] *Hutch. et Dalz.*, Fl. W. Trop. Afr. **1** (**2**), 498, 500 (1928) ; et in Kew Bull. **1929,** 25 (1929) ; Radlk. in Engl., Pflanzenr. **4. 165** (**2**), 1485 (1934).

British Cameroons, Kumba Division. Occasional in undergrowth of high forest, Banga, S. Bakundu Forest Reserve, 11 Mar. 1948, *J. P. M. Brenan* 9275 (K, FHI, O, P) :—shrub about 2 m. high, not much branched ; twigs brown ; leaves papery, deep green and glossy above, paler beneath ; fruits ellipsoid, fleshy, scarlet. Same habitat and locality, 13 Mar. 1948, *J. P. M. Brenan* 9275 A (K, B).

Talbot 1393 from Oban, the type of *A. megaphyllus*, was issued under the name *A. grandifolius* (Baker) Radlk., a very different species from the Cameroons, almost glabrous, with a much larger branched inflorescence, and trifoliolate leaves.

A. megaphyllus has unifoliolate leaves, a point that was not brought out in the original description, in which no definite affinity was suggested for the new species.

In Das Pflanzenreich five African species of *Allophylus* with unifoliolate leaves are enumerated, excluding *A. megaphyllus* of course. I do not consider that there is any specially close affinity between *A. megaphyllus* and any of these. *A. megaphyllus* differs from *A. pervillei* Bl. and *A. monophyllus* (E. Mey.) Radlk. by the coarsely pubescent twigs and petioles ; from *A. melliodorus* Gilg ex Radlk. by the " simple " inflorescences ; and from *A. hirtellus* (Hook. f.) Radlk. and *A. nigericus* Bak. f. by the much larger leaves, long-cuneate towards base. Indeed in the latter point *A. megaphyllus* differs markedly from all the simple-leaved African *Allophyli*.

However, the real relationship of *A. megaphyllus* is in my opinion to be sought not in Africa at all, but among certain Asiatic species with large simple leaves, notably *A. chartaceus* (Kurz) Radlk. from Sikkim and Assam, which at times looks uncannily like the African plant.

A. megaphyllus differs from *A. chartaceus* in the densely pubescent not glabrous stems ; in the absence of short cusp-like lateral projections (doubtless representing rudimentary lateral leaflets) at a point apparently towards the apex of the petiole, but in reality the junction between the true petiole and the petiolule of the terminal leaflet ; and in the much shorter and more densely pubescent inflorescence.

A. zeylanicus L. seems to differ from *A. megaphyllus* in much the same ways.

The diagnosis of *A. megaphyllus* may thus be amplified :—

Ab aliis speciebus simplicifoliis africanis foliis maximis facillime distinguendus. Affinis est speciebus asiaticis *A. chartaceo* (Kurz) Radlk. necnon *A. zeylanico* L., ramulis dense pubescentibus, rudimentis lateralibus basi petioluli terminalis absentibus, inflorescentiis multo minoribus et satis dense pubescentibus differt.

Our specimens of *A. megaphyllus* are in fruit, which was previously unknown in this species, and a short description will fill a gap :—

Fructus plerumque monococci, nonnunquam cocco secundo parvo abortivo adjecto, raro dicocci ; cocci maturi ellipsoideo-subglobosi, 9 mm. longi, 6–8 mm. lati, carnosi, rubri ; pericarpium 0·75–1 mm. crassum, extra (sub lente valido) minutissime puberulum.

APOCYNACEAE

Clitandra flavidiflora (*K. Schum.*) *Hall. f.* in Jahrb. Hamburg. Wissensch. Anstalt. **17** (Beih. 3), 124 (1899) ; Stapf in Thiselton-Dyer, Fl. Trop. Afr. **4** (**1**), 70 (1902).

Carpodinus flavidiflora K. Schum. in Engl., Bot. Jahrb. **23,** 220 (1896).

Aphanostylis flavidiflora (K. Schum.) Pierre in Bull. Soc. Linn. Paris **1898,** 90 (1898).

British Cameroons. Victoria Division. Margin of high forest along roadside about 3–4 miles S. of Banga, 20 Mar. 1948, *J. P. M. Brenan* 9322 (K, FHI, O, P, BM, CA, B) :—liane to about 6 m. ; stems deep purplish-

brown ; leaves thickly papery, deep green and glossy above, pale green beneath with prominent greenish-white midrib ; calyx pale green ; corolla pale yellow.

Distrib. French Cameroons. New to the British Cameroons and the area of the Fl. W. Trop. Afr. In this work *C. flavidiflora* will key down to *C. leptantha* (K. Schum.) Hall. f., from which it may be separated by the secondary lateral nerves and the venation of the leaves raised and rather prominent beneath, by the longer and much stouter buds about 1·2 cm. long and 1·5–2 mm. in diameter, and by the glabrous ovary.

Rauvolfia mannii *Stapf* in Kew Bull. 1894, 21 (1894) ; et in Thiselton-Dyer, Fl. Trop. Afr. **4** (**1**), 113 (1902).

British Cameroons. Kumba Division. Locally frequent in secondary growth along margins of path in medium shade, by the path to Bopo near Banga, S. Bakundu Forest Reserve, 15 Mar. 1948, *C. F. A. Onochie & J. P. M. Brenan* 9422 (K, FHI, O, P, BM) :—semi-woody plant with subsimple stems up to 1 m. high ; young stems green, older ones grey ; leaves papery, deep green and glossy above, lateral nerves slightly impressed, pale green beneath ; calyx pale green ; corolla-tube green with pink stripes, lobes pink ; fruit bilobed or not, green, ultimately bright red, fleshy, glossy.

Distrib. French Cameroons, Gaboon, Belgian Congo. New to the British Cameroons and the area of the Fl. W. Trop. Afr.

Rauvolfia preussii K. Schum. in Engl. et Prantl, Nat. Pflanzenfam. **4** (**2**), 154, fig. 56 S) (1895), seems to me to be doubtfully specifically distinct. *R. preussii* has been found in Nigeria, but is a later name than *R. mannii*.

The spelling of the genus, *Rauvolfia*, was the one used by Linnaeus in the Sp. Plant. (1753) and in the fifth edition of Gen. Plant. (1754), and should be adopted.

Polyadoa camerunensis (*K. Schum. ex Hall. f.*) *Brenan*, comb. nov.

Hunteria camerunensis K. Schum. ex Hall. f. in Jahrb. Hamburg. Wissensch. Anstalt. **17** (Beih. 3), 187 (1899) ; Pichon in Bull. Soc. Bot. France **93,** 253 (1946) ; et in Mém. Mus. Nat. Hist. Nat., n.s., **24,** 161 (1948).

Pleiocarpa camerunensis (K. Schum. ex Hall. f.) Stapf in Thiselton-Dyer, Fl. Trop. Afr. **4** (**1**), 102 (1902).

British Cameroons. Kumba Division. In undergrowth of high forest not far from a stream-gulley, Banga, S. Bakundu Forest Reserve, 12 Mar. 1948, *J. P. M. Brenan* 9401 (K, FHI) :—small tree about 3 m. high, slender-trunked ; twigs green when young, with a longitudinal furrow arising from between petiole-bases on each side ; milky juice present ; leaves papery, deep green and glossy above, midrib prominulous, lateral nerves slightly impressed, beneath pale green with prominent midrib and less prominent lateral nerves ; corolla-tube pale green below, whitish above, lobes pale pink, overlapping to the left. Same locality 13 Mar. 1948, *J. P. M. Brenan* 9401 A (K, FHI, O, P) :—fruiting carpels green, muricate, divergent, with a short upturned beak at apex. Same locality, 19 Mar. 1948, *J. P. M. Brenan* 9401 B (K).

Distrib. French Cameroons. New to the British Cameroons and to the area of the Fl. W. Trop. Afr.

The most important factor affecting the generic position of this plant is the number of ovules. Hallier, describing it as a *Hunteria*, said that each carpel had 8 ovules arranged in 4 rows. Later Stapf, transferring it to *Pleiocarpa*, said that he had not been able to find more than 4 ovules per carpel. Then Pichon, accepting Hallier's original placing in *Hunteria*, described the carpels as 3–4-ovulate, enumerating, however, various other characters otherwise anomalous in *Hunteria*.

Hallier cited *Zenker* 1211 and 1620 as the type-numbers of the species. The sheets of these at Kew are not in a state to permit examination of the flowers, but I have examined an ovary of *Zenker* 2311, cited by Stapf, and which I agree is certainly conspecific ; one carpel of this had 9 ovules, the other 8. In 2 carpels of my own gathering I found in each 11 ovules.

The ovules are exceedingly small and difficult to count, owing to their frequent habit of clinging together with very close packing into a flattened mass, and I cannot help suspecting that this has led to miscounting by Stapf and Pichon. The biseriate arrangement was shown by the 8 ovules, but more or less breaks down with the higher numbers. Thus, I believe that Hallier's original description of the ovule-number was correct, and, accepting the true number of ovules as 8–11, the plant can hardly be either a *Pleiocarpa* or a *Hunteria*, where the ovules are normally 1–2 per carpel, and never more than 4.

It does, however, find on apparently natural position in *Polyadoa*, where the ovules are described as 10–24 per carpel, and whose facies is similar to our plant. It is nearest, it seems, to *P. umbellata* (K. Schum.) Stapf, which differs in its rounded not acute or bluntly pointed sepals, longer corolla-tube (7 mm. long, as against 4 mm.), longer lobes (6·5 mm. as against 4 mm.), much larger style, stigma much shorter than the " clavoncule ", and more numerous ovules.

Stapf, the creator of *Polyadoa*, later abandoned his own genus in favour of *Picralima* Pierre (Kew Bull. **1908,** 302–3 (1908)), a reduction accepted by Hutchinson and Dalziel. Recently, however, in Mém. Mus. Nat. Hist. Nat., n.s., **24,** 159–60 (1948), Pichon has given reasons for keeping *Polyadoa* apart from *Picralima*, and I am inclined to follow him in this, and the necessary new combination is therefore made under *Polyadoa*.

Voacanga diplochlamys *K. Schum.* in Engl. et Prantl, Nat. Pflanzenfam. **4** (**2**), 149 (1895) ; Stapf in Thiselton-Dyer, Fl. Trop. Afr. **4** (**1**), 160 (1902) ; Hutch. et Dalz., Fl. W. Trop. Afr. **2,** 41–2 (1931).

British Cameroons. Kumba Division. In shade of high forest about half a mile from Banga timber camp towards Banga village, S. Bakundu Forest Reserve, 11 Mar. 1948, *C. F. A. Onochie* 9300 (K, FHI) :—small tree about 6 m. high, with wide crown ; exudes white milky latex on slashing ; peduncle and calyx pale green ; petals yellow.

The bracts in *V. diplochlamys* are not infrequently caducous, and when this happens the species is liable to be keyed down to *V. africana* Stapf. These two species may be separated by the flowers, white or cream in *V. africana*, yellow in *V. diplochlamys* ; the petiole of *V. diplochlamys* is normally decidedly longer and more slender than in *V. africana*.

Pichon, in Bull. Mus. Nat. Hist. Nat., ser. 2, **19,** 413 (1947), sinks *V. diplochlamys*, with a query, under *V. schweinfurthii* Stapf var. *puberula* (K. Schum.) Pichon, the variety differing from typical *V. schweinfurthii* merely by being puberulous on the branchlets and petioles. I disagree altogether with this. *V. schweinfurthii* differs from *V. diplochlamys* in the longer corolla-tube, lobes many times as large, larger calyx, longer pedicels etc. *V. diplochlamys* to me appears uniform and worthy of maintenance as a species.

Farquharia elliptica *Stapf* in Kew Bull. **1912,** 279 (1912) ; Hutch. et Dalz., Fl. W. Trop. Afr. **2,** 607 (1936).

Alafia jasminiflora A. Chev., Expl Bot. Afr. Occ. Franç., 423 (1920), *nomen nudum.*

Alafia mirabilis A. Chev., *l.c.*, *nomen nudum.*

Holalafia jasminiflora Hutch. et Dalz., Fl. W. Trop. Afr. **2,** 43 (1931) ; et in Kew Bull. **1937,** 338 (1937).

Aladenia jasminiflora (Hutch. et Dalz.)Pichon in Mém. Inst. Sci. Madagascar, sér. B, **2** (**1**), 61 (1949).

Nigeria. Benin Province, Benin Division. Edge of high forest by road between Uyere and Oke, Owam Forest Reserve, 11 Feb. 1948, *C. F. A. Onochie & J. P. M. Brenan* 8987 (K, FHI) :—scandent shrub up to about 6 m. high ; young stems green, older grey-brown ; leaves thickly papery, deep green and glossy above, very pale green beneath ; inflorescence-axes brownish-green ; calyx-lobes pale green ; corolla-buds white outside with faint green tinge.

When Stapf described *Farquharia* he compared it with *Isonema* in habit, saying that the former differed in the symmetrical corolla-lobes and included stamens inserted at the middle of the tube, but it is strange that he should not have even mentioned its relationship with *Alafia* or *Holalafia*, both of which differ from *Isonema* in exactly the same points. Farquhar's specimen shows rather old inflorescences with most of their flowers gone ; but the resemblance to *Isonema* is considerably less when you see the more ample and better material now available.

Dissection of the type-specimen of *Holalafia jasminiflora* (*Chevalier* 17606) shows that it is conspecific with *Farquharia elliptica*. But their placing it in *Holalafia* is clearly wrong on account of the apocarpous ovary. The carpels in Chevalier's specimen are densely tomentellous, and so clearly apocarpous that the hairs actually extend round the inner contiguous faces of the two carpels.

Its relationship to *Alafia* is clear, as was recognised by Pichon (*l.c.*) who made his new genus *Aladenia* in ignorance of the fact that *Holalafia jasminiflora* is synonymous with *Farquaharia*, which must accordingly be kept if it is to be generically separated from *Alafia*.

Farquharia elliptica has been recorded from the Ivory Coast, Gold Coast and Nigeria.

I must sincerely thank my colleague, Mr. R. D. Meikle, for giving me his views on the above treatment.

Baissea calophylla (*K. Schum.*) *Stapf* in Thiselton-Dyer, Fl. Trop. Afr. **4** (**1**), 205 (1902).

Codonura calophylla K. Schum. in Engl. et Prantl, Nat. Pflanzenfam. **4** (**2**), 285 (1897).

Nigeria. Benin Province, Benin Division. Secondary roadside fringe through high forest, Compartment 61, Okomu Forest Reserve, 27 Feb. 1948, *J. P. M. Brenan* 9162 (K, FHI, O, P, BM, CA, B) :—climber, cut-down and flowering on shoots a few feet high ; young stems green ; leaves papery, mid-green and very glossy above, pale green and glossy beneath, lateral nerves slightly impressed above ; flowers sweetly scented, white, throat pale pink inside, lobes spreading.

This species is not in the Fl. W. Trop. Afr. It has been previously recorded from the French Cameroons.

In the key to *Baissea* in the Fl. W. Trop. Afr. *B. calophylla* will come straight down to the pair of species, *B. brachyantha* Stapf and *B. leonensis* Benth. From both of these it is immediately separable by the glabrous not furfuraceous or pubescent panicle and corolla, by the much larger leaves mostly about 12–20 cm. long and 4·5–7 cm. wide with a longer acumen, and by the larger flowers, the tube 0·7 cm. long, the lobes 1·5–1·8 cm. long.

MARANTACEAE

(by E. Milne-Redhead)

Marantochloa mannii (*Benth.*) *Milne-Redhead* in Kew Bull. 1952 (1952).

Calathea mannii Benth. in Benth. et Hook. f., Gen. Pl. **3,** 653 (1883).

Phrynium hensii Baker in Thiselton-Dyer, Fl. Trop. Afr. **7,** 323 (1898).

Phrynium mannii (Benth.) K. Schum. in Engl. Pflanzenr. **4. 48,** 56 (1902).

Clinogyne hensii (Baker) K. Schum. in Engl., Pflanzenr. **4. 48,** 62 (1902).

Marantochloa hensii (Bak.) Pellegr., Fl. Mayombe, **3** (Mém. Soc. Linn. Norm., n.s., Bot., 1, fasc. IV) 45 (1938).

Benin Province, Benin Division. Okomu Forest Reserve, about one mile S. of Nikrowa Rest-House, locally abundant in bed of sandy dried-up stream, 10 Dec. 1947, *J. P. M. Brenan* 8470 (K, FHI, P, BM, CA) :—caespitose herb, caulescent, branched, up to 2 m. high ; lamina stiffly papery, deep green and glossy above with primary lateral nerves more or less impressed ; petiole laterally flattened below pulvinus, sheath with reddish edges ; bracts and calyx reddish ; corolla pale red-purple ; staminode yellow.

Distrib. Gold Coast, Fernando Po, Gaboon, Belgian Congo, Uganda and north-western Tanganyika Territory ; new to Nigeria.

M. mannii Benth. is represented by only three gatherings from the area covered by the Flora of West Tropical Africa. The original gathering was from Fernando Po, and was described as a species of *Calathea* by Bentham. It was doubtfully transferred to *Phrynium* by K. Schumann, and has remained as a species endemic to that island until it was recently discovered not to be a *Phrynium* but to be conspecific with *Marantochloa hensii* Pellegr., a plant which is widely spread in forests from Gaboon to

Uganda. Mr. Brenan's specimen was the first record from the mainland, since which *M. mannii* was received at Kew from the Gold Coast in 1950, where it was found by Mr. K. Obeng-Darko in forest near Kumasi. *M. mannii* is readily distinguished from all the species of *Marantochloa* included by Hutchinson in the Flora of West Tropical Africa on account of its densely congested inflorescence which on first sight recalls that of *Phrynium confertum* (Benth.) K. Schum., or as it now has to be called *Ataenidia conferta* (Benth.) Milne-Redh. *M. mannii* is probably most closely related to *M. ramosissima* (K. Schum.) Hutch., which has similar habit, leaves and bracts, but which differs in the elongate spike-like inflorescence.

COMMELINACEAE

Commelina longicapsa *C. B. Cl.* in DC., Monogr. Phan. **3,** 176 (1881) ; et in Thiselton-Dyer, Fl. Trop. Afr. **8,** 55 (1901).

Benin Province, Benin Division. Okomu Forest Reserve, Compartment 70, on ground in semi-shade in small clearing of high forest, very local, 16 Dec. 1947, *J. P. M. Brenan* 8525 (K, FHI, P) :—stems decumbent, stout, greenish-purple ; leaf-sheaths purple ; leaves stiffly papery, deep green and glossy above, pale green beneath ; petiole purplish ; spathes whitish-green with brown veins ; flowers white ; anthers yellow. Okomu Forest Reserve, Compartment 84, 17 Feb. 1948, *J. P. M. Brenan* 8525 A (K).

Only recorded hitherto from the Gaboon, Spanish Guinea and Portuguese Congo. In the Fl. W. Trop. Afr. it will key down to the group of species numbers 3–6, from all of which it is exceedingly distinct by its large obovate leaves about 9–15 × 4–6 cm. on petioles 1–3 cm. long, by its capitate spathes without any rusty bristles on the margins, and by its white flowers.

Buforrestia brachycarpa *Gilg et Lederm. ex Mildbr.* in Notizbl. Bot. Gart. Berlin **9,** 258 (1925).

var. **hirsuta** *Brenan*, var. nov. ; vaginis foliorum extra dense patentim villosis, lamina utrinque satis dense appresse pilosis recedit.

Benin Province, Benin Division. Okomu Forest Reserve, local in leaf-litter in fairly deep shade in a dried-up sandy stream-gulley about 2½ miles S. of Nikrowa Rest-House, 12 Dec. 1947, *J. P. M. Brenan* 8486 (K, FHI, P, BM) :—herb ; stems creeping shortly then ascending-erect, purple ; leaf-sheaths purple ; leaves yellow-green above, somewhat glossy and undulate, pale green beneath, midrib green or dull purplish ; flowers whitish-green. Okomu Forest Reserve, Compartment 86, in swamp-forest with *Uapaca paludosa, Anthostema aubryanum, Homalium molle* etc., 21 Feb. 1948, *J. P. M. Brenan & C. F. A. Onochie* 9090 (typus varietatis in Herb. Kew., FHI, P) :—ascending herb ; stems purplish-green ; leaf-sheaths pale green ; leaves thin, mid- to deep green and scarcely glossy above, midrib impressed ; inflorescence-branches spreading ; calyx whitish-green, glistening, with glandular hairs.

Of *B. brachycarpa*, described from the French Cameroons, I have been kindly loaned the type, *Ledermann* 958 (Nkolebunde S.E. of Kribi, 23 Oct.

1908), from the Herbarium of the Botanisches Museum at Berlin-Dahlem. I must thank Prof. Dr. J. Mildbraed for his kindness and courtesy in doing this. He writes that the original specimens of *B. brachycarpa*, *Ledermann* 800 and *Mildbraed* 4353, are now destroyed. It is exceedingly distinct from all the previously described species on account of the seeds being 2–4 per loculus. Our plants seem to have normally 2. At present I am certainly not prepared to make the Nigerian plant more than a variety, as elsewhere in *Commelinaceae* I have repeatedly found differences based on indumentum alone to be merely varietal, and I can find nothing except the indumentum to separate the Nigerian plant from typical *B. brachycarpa*.

From *B. imperforata* C. B. Cl. our plant differs in the densely villous sheaths, leaves less caudate-acuminate at apex, shorter and wider capsules shorter than or scarcely equalling the sepals, and of course the few seeds.

Forrestia tenuis (*C. B. Cl.*) *Benth.* in Benth. et Hook. f., Gen. Pl. **3,** 851 (1883) ; C. B. Clarke in Thiselton-Dyer, Fl. Trop. Afr. **8,** 77 (1901).

Buforrestia ? tenuis C. B. Cl. in DC., Monogr. Phan. **3,** 234 (1881).

Forrestia africana K. Schum. ex C. B. Cl. in Thiselton-Dyer, Fl. Trop. Afr. **8,** 77 (1901).

Forrestia preussii K. Schum. in Engl., Bot. Jahrb. **24,** 344 (1897) ; Hutch. et Dalz., Fl. W. Trop. Afr. **2,** 309 (1936).

British Cameroons. Kumba Division. Plentiful in swampy ground in gulley in deep shade in high forest near Banga, S. Bakundu Forest Reserve, 20 Mar. 1948, *J. P. M. Brenan* 9315 (K, FHI, P, BM, CA) :—flowers red-mauve. Local in high-forest undergrowth, also seen in swampy ground in shade, near Banga, S. Bakundu Forest Reserve, 18 Mar. 1948, *J. P. M. Brenan* 9472 (K, FHI, P, BM, CA) :—herb with stout ascending green stems trailing at base and rooting at nodes ; leaves papery, deep green and glossy above, paler beneath ; sepals 3, reddish-mauve ; petals 3, whitish-mauve with a deep red-mauve longitudinal central stripe ; stamens 6, all fertile, filaments white, with long white hairs towards apex ; anthers yellow. Victoria Division. Plentiful in undergrowth of montane forest in deep shade, 340 m. above Mimbia village, Cameroon Mountain, 24 Mar. 1948, *Dr. E. W. Jones & J. P. M. Brenan* 9363 (K).

I cannot distinguish *F. africana* and *F. tenuis*. The spikes when young are subglobose as in *F. tenuis* and then lengthen out as in *F. africana*, and quadrangular stems are correlated with both conditions.

Distrib. British and French Cameroons, Gaboon, Spanish Guinea. It has been recently collected in Nigeria proper (Benin Province, Benin Division. Sapoba Forest Reserve, Compartment SS.I, high forest, 3 Nov. 1950, *R. W. J. Keay FHI* 28070 (Herb. Kew.) :—erect herb ; stem and underside of leaves purple-tinged ; fruits pale green.

Coleotrype laurentii *K. Schum.* in Engl., Bot. Jahrb. **33,** 377 (1903) ; De Wild., Pl. Bequaert. **5,** 229 (1931).

Benin Province, Benin Division. In T.S.S. Compartment (i.e. high forest where undergrowth has been artificially cleared), locally very

abundant and in places dominant, also frequent in high-forest shade but smaller and sparser, Okomu Forest Reserve, Compartment 53, 12 Feb. 1948, *C. F. A. Onochie & J. P. M. Brenan* 9001 (K, FHI, O, BM) :— straggling herb up to about 2 m. long, often stoloniferous at base, rooting at nodes and sprawling, often with stilt-roots from lower nodes ; stems stout, green, terete, shining ; leaf-sheaths pale green with darker lines, glistening ; leaves papery, ± undulate, mid-green and glossy on both sides ; inflorescences mainly from lower nodes, sometimes on ground ; bracts green ; corolla white, lobes reflexed ; stamen-filaments white ; anthers pale yellow.

This species was based on *Dinklage* 1223 from Batanga, French Cameroons, now presumably destroyed, and *Laurent s.n.* (" Forêts, Kassai, Lulua, Sankurru ", Belgian Congo), which I have seen, owing to the kindness of the Director of the Jardin Botanique de l'Etat, Brussels in sending it on loan. *Louis* 2428 from Yangambi, Belgian Congo (Herb. Kew.) agrees well, and we also have the following specimen from Uganda :—

Uganda. Buganda Province, Mengo District. Kajansi Forest, Mile 10, Entebbe Road, alt. 1160–1175 m., Feb. 1938, *P. Chandler* 2170 :— in forest with small stream close by ; no flowers seen ; growing in dense shade supported to some extent by neighbouring vegetation.

The plant referred to as " *Forrestia sp. aff. tenuis* Benth. " in " The Natural Forest Inviolate Plot ", 17 (1948) by the late Mr. A. P. D. Jones, is *C. laurentii*.

C. laurentii is liable to be taken for a *Forrestia* on account of the inflorescences being sessile clusters perforating the leaf-sheaths ; but the numerous and relatively large ovate foliaceous bracts subtending the white flowers will easily separate it from *Forrestia tenuis*.

Floscopa myosotoides *Hutch.* in Hutch. et Dalz., Fl. W. Trop. Afr. **2,** 311 (1936), *anglice descripta* ; et in Kew Bull. **1939,** 241 (1939), *latine descripta*.

Benin Province, Benin Division. Sapoba, Jamieson River, floating in sudd at river-margin, 1 Feb. 1948, *Dr. P. W. Richards* 3928 (K, FHI, P).

Previously recorded from Senegal, French Guinea, Sierra Leone and Liberia, so that Dr. Richards' discovery is an enormous range-extension. It is rather more robust than other material, but there is nothing more that I can see.

Algae*—Although Phycology has made remarkable headway in the last twenty five years, as much perhaps as any other branch of Botany, it still has a good deal of leeway to make up. Algologists have suffered from two major handicaps ; the difficulty of studying the living plants in their natural environment coupled with the fact that much of the literature is scattered and incomplete. The present volume therefore, whatever its short-comings, is a much needed addition to phycological

literature, if only because it brings together a mass of information not always accessible either to the student or the professional.

Compiled on the same lines as the Manual of Bryology and the Manual of Pteridology, the two earlier works in this series, it is edited by G. M. Smith and contains the following independent chapters :—History of Phycology by G. W. Prescott ; The Classification of the Algae by G. M. Smith ; Chlorophyta by M. O. P. Iyengar ; Euglenophyta by T. L. Jahn ; Chrysophyta by F. E. Fritsch ; Pyrrophyta by H. W. Graham ; Phaeohhyta by G. F. Papenfuss ; Cyanophyta by F. Drouet ; Rhodophyta by K. M. Drew ; Fossil Algae by J. H. Johnson ; Cytology of Algae by H. C. Bold ; Sexuality of Algae by G. M. Smith ; The Pigments of Algae by H. H. Strain ; Physiology and Biochemistry of Algae by L. R. Blinks ; Ecology of Fresh Water Algae by L. H. Tiffany ; Ecology of Marine Algae by J. Feldmann ; Plankton Algae and their Biological Significance by B. H. Ketchum. These are followed by two appendices on Methods for the Cultivation of Algae by E. G. Pringsheim and Microtechnique by D. A. Johansen.

No such work has hitherto appeared in English. †Fritsch's two volumes certainly provide us with a remarkably good work of reference but only the experienced are likely to find their way about them. Chronica Botanica has done its best to provide a readable précis which, with the rapidly growing interest in Algae, should be much in demand. It has the faults that are almost inevitable in any book of its kind. Too much is crowded into the space available with the result that there is a tendency to lose perspective, as for instance in the first chapter where, in reference to W. H. Harvey it is stated " He contributed much to a knowledge of British and American Algae." In fact he had many interests outside these countries and his most extensive publication is the Phycologia Australica. Similarly, in the second chapter there is the too sweeping generalisation that in the Rhodophyta the sexual and asexual generations " are identical in size, shape and vegetative structure." Surely some mention might have been made of recent research on dimorphism in *Galaxaura*?

The format is good and a distinct improvement on the two previous volumes. Illustrations are well chosen and executed. The bibliographies provided at the end of each chapter are perhaps a little uneven, but are on the whole quite adequate. Additional care in proof-reading would have eliminated some of the printer's errors which are unfortunately all too evident on some pages. These, however, are minor faults ; the " Manual of Phycology " is an admirable work on a very difficult subject, and to anyone wanting a bird's eye view of the Algae it should give complete satisfaction at a moderate cost.

C. I. Dickinson.

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*Manual of Phycology : An Introduction to the Algae and their Biology. Edited by Gilbert M. Smith (Stanford University). Pp. 375. Pls. and Figs. 48. 1951. Waltham, Mass. : The Chronica Botanica Co.
London, W.C.2 : Wm. Dawson and Sons, Ltd. $7.50.

†Fritsch, F. E. The Structure and Reproduction of the Algae, 2 Vols. 1935–45. Camb. Univ. Press.

LEPIOTA AND ALLIED GENERA IN TRINIDAD, BRITISH WEST INDIES.

R. W. G. Dennis.

The following descriptions and diagnoses were made from fresh material collected by the author in autumn 1949. They thus supplement the meagre diagnoses published by earlier workers from the study of dried specimens sent to Europe by collectors in the West Indies.

Amanita (*Pers.*) *ex S. F. Gray*, Nat. Arrang. Br. Pl. **1,** 599 (1821).
Type species : *Agaricus bulbosus* Schaeff. = *Amanita citrina* (Schaeff. ex Fr.) Roques.

Amanita antillana *Dennis*, spec. nov. Pileus 9 cm. latus, convexus, subumbonatus, glaber, subviscidus, olivaceo-brunneus, margine sulcato-striatus ; lamellae latissimae, albae, liberae ; stipes apices attenuatus, 9 cm. × 13 mm., pallidus, fibrillosus, fistulosus, annulo nullo, volva obsoleta ; sporae subglobosae, 9·5–13·5 × 7·5–11·5μ, guttulatae. Ad terram in silvis, Quinam, Trinidad Dennis 286, Typus.

In many ways this collection recalls *A. inaurata* Secr. of Europe and I was inclined to regard it as a slender variety of that species. M. Gilbert, the authority on Amanita, who has seen a copy of my watercolour and part of the pileus dissents from this suggestion and has favoured me with the following opinion. " Si la volve est très friable (non membraneuse) et constamment détruite, comme votre aquarelle permet de le supposer, il s'agit d'un *Amanitopsis* qui ne peut être confondu avec aucun de ceux que nous avons en Europe. Dans la classification, à cause de la volva très friable il faudrait bien le placer dans le groupe des Amanites qui avoisinent le *A. inaurata*. Je ne peux estimer—les *Amanitopsis* ayent si peu de caractères distinctifs—sans le voir vivant, s'il agit d'une varieté du *A. vaginata* ou d'une espèce distincte. Ce n'est pas, du moins j'en ai le sentiment, une varieté du *A. inaurata* ".

As I collected No. 286 personally and am confident there was no membranous volva I feel unable to refer it to a variety of *A. vaginata* and accordingly propose a new species. *Amanitopsis* Roze is considered by modern authors as at best a subgenus of *Amanita*. It is somewhat remarkable that though Gilbert described 25 species of *Amanita* from tropical Africa and 4 from tropical Asia he had none from tropical America unless one includes *A. abruptiformis* Murrill from Florida. Prof. Baker, who has observed and collected Agarics for many years in Trinidad has seen no other material there referable to *Amanita*. *Amanitopsis floridana* Murrill has a membranous volva and spores 11–13 × 6–7μ.

Oudemansiella *Speg.* An. Soc. Cient. Arg. **12,** 24 (1881).
Mucidula Pat., Les Hyménomycètes d'Europe 95 (1887).
Type species : *Oudemansiella platensis* (Speg.) Speg.

Oudemansiella canarii (*Jungh.*) *von Höhnel* in Sitz. Kaiserl. Akad. Wiss. Wien, Math, naturw. Kl. **118,** 276 (1909).
Agaricus canarii Jungh., Floram Cryptogam. Javae Ins. 82 (1838).

Agaricus alphitophyllus Berk. et Curt. in Proc. Amer. Acad. 4, 112 (1860).
Mycena alphitophylla (Berk. et Curt.) Sacc., Syll. Fung. 5, 305 (1887).
Mucidula alphitophylla (Berk. et Curt.) Pat. in Bull. Soc. myc. France **25,** 9 (1909).
Chamaemyces alphitophyllus (Berk. et Curt.) Murr. in Mycologia **3,** 91 (1911).
Armillaria alphitophylla (Berk. et Curt.) Murr. in N. Amer. Flora **10,** 39 (1914).
Collybia alphitophylla (Berk. et Curt.) Ito & Imai. Trans. Sapporo Nat. Hist. Soc. **16,** 15 (1939).
Agaricus cheimonophyllus Berk. et Curt. in J. Linn. Soc. Bot. **10,** 284 (1869).
Armillaria cheimonophylla (Berk. et Curt.) Sacc., Syll. Fung. **5,** 86 (1887).
Mucidula cheimonophylla (Berk. & Curt.) Pat. in Bull. Soc. Myc. France **15,** 192 (1899).
Agaricus platensis Speg. in An. Soc. Cient. Arg. p. **9,** 161 (1880).
Oudemansiella platensis (Speg.) Speg. in An. Soc. Cient. Arg. **12,** 24 (1881).
Tricholoma albosquamulata Beeli in Bull. Soc. Bot. Belg. **60,** 77 (1927).

Fig. 1. *Oudemansiella canarii,* two sporophores and section natural size, Dennis 240, spore, cystidium and basidium × 660, on right outline of Oersted's drawing of *Hygrophorus variolosus.*

Pileus up to 6 cm. diameter, convex becoming flattened, white or tinged buff at the disc, viscid, dotted with small scurfy isabelline scales, margin slightly striate, at first appendiculate with the white veil ; flesh thick at the disc, thin at the margin, white ; gills broad, of four lengths,

rather crowded, adnate to sinuate, white ; stipe white, smooth, dry, equal above a somewhat bulbous base, without a ring. Squamules formed of globose to pyriform thin-walled cells 30–40μ across, pileus surface of very loosely woven hyphae 5–7μ wide in colourless mucilage, trama of more compact hyphae 20μ wide, pleurocystidia ventricose, up to 165 × 27μ, cheilocystidia similar but shorter, up to 95 × 25μ, basidia very large, about 70 × 25μ with four stout sterigmata about 16 × 4μ, spores globose about 15–19μ, filled with large oil globules, spore print pure white, non-amyloid. Sporophores gregarious on dead trunks and branches. Fig. 1.

American collections seen : Trinidad : Hill behind River Estate, Diego Martin, 27.x.1949, *Dennis* 240 ; Siparia Forest Reserve, 4.xi.1949, *Dennis* 240A ; Cuba : *Wright* 11, on logs, May. (Typus of *A. cheimonophyllus*). *Agaricus radiculosus* Cooke from Rio de Janeiro is also an *Oudemansiella*, either the present species or *O. echinosperma* Sing.

Singer (1951 accepts *Oudemansiella canarii* as the name for this well known species and after considerable hesitation I have decided to follow him. Junghuhn's diagnosis agrees with it quite well but there has been some uncertainty about the identity of the genera *Oudemansiella* and *Mucidula*. According to Rick (1907) " *Oudemansiella* est *Mycena* a Phycomycete parasitante transformata. Quotes observavi hymenium sub microscopio, inveni basidia, quae in hoc forma sunt gigantea, repleta spermatozoidiis 3μ diam. quae jam in ipsis basidiis motu vivo gaudent, eadem etiam in sporis vegetis observantur, quae duplicem membrana habent. Mycelium intercellulore parasitae observare non contigit, sed e spora perennante aestimo parisitam ad genus *Hyphochytrium* pertinere." This strange observation has not to my knowledge been confirmed and one must assume that Singer, working in the native land of *O. platensis*, knows what it is like. Recently (Singer 1952) he has explained the reference to a split gill edge in the original diagnosis of *Oudemansiella* as a juvenile condition obliterated in the mature gills. The type of *A. alphitophyllus* was from the Bonin Islands and I should have hesitated to admit its identity with this common fungus of tropical America had not Ito and Imai published an excellent description of fresh Bonin Island material in 1939. From this there can be little doubt of the identity of their fungus with mine. It is evidently the pantropical representative of *Oudemansiella mucida* (Schrad. ex Fr.) von Höhn. and Ito and Imai cite as additional synonyms *Ag. leucoconis* Berk. et Curt., also from the Bonin Islands, *Ag. apalosarcus* Berk. et Br., *Ag. magisterium* Berk. et Br. and *Ag. euphyllus* Berk. et Br. from Ceylon. According to von Höhnel *Phaeolimacium bulbosum* P. Henn. and *Pluteus macrosporus* P. Henn. are synonyms of *Ag. apalosarcus*. Murrill suggested that Oersted's drawing on which *Hygrophorus variolosus* Fr. 1851 from Costa Rica was based may have been made from this common species. If so, Fries statement that it grew " ad terram " must be an error. No specimen of *H. variolosus* now remains at Copenhagen. *O. canarii* and its synonyms have not hitherto to my knowledge been reported from tropical Africa. In response to enquiries on this point Dr. R. L. Steyaert kindly drew my attention to the description of *Tricholoma albosquamulata* Beeli from the Congo. Examination of the type, kindly loaned to Kew by Prof. Robyns, has confirmed its identity with *O. canarii*. Thus this easily recognised fungus has been

referred by those who knew it only in the dried state to eight genera, in addition to the comprehensive *Agaricus* and the dubious record as *Hygrophorus*. This is one of the most striking examples of the futility of naming tropical agarics by mycologists who had not seen them fresh.

Chlorophyllum *Massee* Kew Bull. 136 (1898) emend. Singer in Pap. Michigan Acad. Sci. **32,** 137 (1948).

Chlorophyllum has generally been reduced to synonymy under *Lepiota* but in a recent detailed study of *C. molybdites* Singer (1948) has advocated its recognition as an independent genus. This opinion is based on its spore structure, colour and staining reaction with cresyl-blue, presence of a poisonous substance in the flesh and the absence of clamp connections such as occur on hyphae of *L. procera* and its allies (*Macrolepiota* Singer).

Chlorophyllum molybdites (*Meyer ex Fr.*) *Massee* in Kew Bull. 136 (1898).

Agaricus molybdites Meyer ex Fr., Syst. Myc. **1,** 308 (1821).

Agaricus morgani Peck in Bot. Gaz. 4, 137 (1879).

Agaricus glaziovii Berk. in Vidensk. Meddel. 1879–80, p. 32.

Lepiota molybdites (Meyer ex Fr.) Sacc., Syll. Fung. **5,** 30 (1887).

Pholiota glaziovii (Berk.) Sacc., Syll. fung. **5,** 751 (1887).

Lepiota ochrospora Cke. & Massee in Grevillea **21,** 73 (1893).

Chlorophyllum esculentum Massee in Kew Bull. p. 136, 1898.

Chlorophyllum morgani (Peck) Massee in Kew Bull. p. 136, 1898.

Lepiota esculenta (Massee) Sacc. & Syd. Syll. fung. 16, 2 (1901).

The species is probably pantropical but only American collections have been cited below. According to Morgan the pileus of *L. morgani* may attain 28 cm. diameter.

Collections seen : British Guiana : coast lands on dry mounds at the base of trees, July 1892, *Jenman* 6426 (Typus of *L. ochrospora*) ; coastland pastures, May 1896, *Jenman* 6166 (typus of *Chlor. esculentum*) ; Brazil : Rio de Janeiro, M. Glaziou (Typus of *Ag. glaziovii*) ; Trinidad : St. Augustine, I.VIII.1947, *Baker* 1486 ; Florida : Gainesville, Alachua Co., 16.V.1943, *R. Singer as* Reliq. Farlow. 984 sub. nom. *Leucocoprinus molybdites* (Meyer ex Fr.)) Pat. ; Illinois : Geneseo, July 1898, *E. T. & S. A. Harper*, ex Herb. Nat. Hist. Mus. Chicago ; Ohio : Dayton, 13.X.1879, *A. P. Morgan* (authentic for *Ag. morgani*). Murrill is probably correct in adding to the synonymy *Ag. guadalupensis* Pat. 1899.

This extensive synonymy is due mainly to the colour changes in the spore print and gills coupled by the unco-operative attitude of collectors who sent specimens to European mycologists without adequate descriptions of their fresh appearance. It seems to be generally assumed that *Ag. molybdites* Meyer was the fungus described above. All that is known of the type is Meyer's diagnosis which reads : " A. pileo carnoso planivsculo albido brunneo-squamoso, lamellis albocoerulescentibus, stipite infra annulum squamoso basi bulboso. Ad terram. Viget Januario. Affinis A. proceri." Because of the coloured gills and the comment on its resemblance to *L. procera* this conception is accepted here but in view of

Meyer's description of the stipe as squamulose collectors in tropical America may bear in mind the possibility of finding two species of large green-spored *Lepiota*, one smooth stalked, the other with stipe scaly below the ring. In spite of Meyer's reference to *Ag. procera*, Fries in Systema mycologicum referred *Ag. molybdites* doubtfully to synonymy under *Coprinus comatus*. Later, after seeing a specimen sent by Oudemans from a hothouse at Utrecht, and apparently one from Brazil, he realised his error and redescribed it in Hymenomycetes europaei as a green-spored *Lepiota* with smooth, blackish-brown stipe. The stipe does turn dark brown to almost black when dried.

Lepiota (Pers.) ex S. F. Gray, Nat. Arrangement Br. Plants, p. 601 (1821).

Type species : *Agaricus procerus* Scop. ex Fr.

Key to species :

A. Ring absent, pileus thin, plicato-crenate, spores red-amyloid ; subgenus *Hiatula*

1. Spores 5μ broad or over, pileus over 1 cm. diameter . *L. minima*

2. Spores less than 4μ broad, pileus usually less than 1 cm. diameter

a. Pileus white, turning flesh-pink . . . . . *L. roseolamellata*

b. Pileus white with dark gray umbo and squamules *L. nigropunctata*

B. Ring present, sometimes fugacious.

I Spores laterally apiculate . . . . . *L. subgranulosa*

II Spores elliptical

1. Spores red-amyloid

a. Spores 9–11 × 6·7μ with a germ pore, becoming brownish with age . . . . . *L. muticolor*

b. Spores permanently hyaline

α Pileus bright yellow, spores 7–11 × 5–6·5μ, with a germ pore . . . . . *L. lutea*

β Pileus chalk white, mealy, spores 7–10 × 5–6μ with a germ pore . . . . . *L. cepaestipes*

γ Pileus red or reddish purple in whole or in part

†Stipe smooth

* Pileus with red umbo and squamules . *L. rubrotincta*

** Pileus red throughout . . . . *L. pseudoroseola*

† Stipe and pileus alike covered with purplish-red squamules *L. erythrosticta*

δ Pileus ochraceous to orange, spores long and narrow *L. floralis*

ε Pileus and squamules same shade of gray or brown (if white, then spores not as in β)

* Large species with broad membranous ring, flesh turning red or orange brown when broken, spores 7–11 × 5–6μ

† Pileus cuticle cracked into large adherent squamules *L. hortensis*

†† Pileus surface of erect hairs cracking into minute squamules . . . . . *L. biornata*

** Large species with movable ring, spores 5–6 × 4–4·5μ pileus surface of velvety hairs . . . *L. abruptibulba*

*** Ring fixed or pileus very small, spores less than 8μ long except in *L. cultorum*

† Pileus large, surface of radiating innate gray-brown fibrils . . . . . *L. subamanitiformis*

†† Pileus up to 4 cm. diameter, plicato-striate at least half way to the disc

‡Squamules of erect tufted hairs, stipe scurfy below ring *L. zamurensis*

‡‡ Squamules of more or less prostrate hyphae, stipe smooth

§ Squamules dark brown to black, pileus small *L. microphalis*

§§ Squamules white or absent, pileus small *L. microphalis* v. *lactea*

§§§ Squamules yellowish, pileus larger *L. subclypeolaria*

††† Pileus not striate or only slightly so at the margin only.

‡ Stipe below ring white or nearly so, fibrillose, not downy or scaly

§ Pileus surface of downy hairs, cracked into minute squamules . . . . . *L. citriodora*

§§ Pileus surface of matted fibrils, cracked into rounded squamules . . . . . *L. alluviina*

‡‡ Stipe more or less coloured below the ring

§ Pileus surface of prostrate or matted hyphae

‖ Pileus orange-rufous, stipe stout, solid *L. tobagensis*

‖ ‖ Pileus gray or brown

◊ Squamules erect, pointed

• Spores 9–11 × 4–4·5μ . . *L. cultorum*

•• Spores 6–7 × 3–3·5μ . . . *L. gracilis*

◊◊ Squamules of prostrate loose hyphae

• Gills pink . . . . . *L. rimosa*

•• Gills white . . . . . *L. sordescens*

§§ Pileus surface a velvety pile of erect hairs

‖ Pileus red-brown, hairs pointed . *L. azalearum*

‖ ‖ Pileus hairs obtuse

◊ Gills yellowish . . . . . *L. citrophylla*

◊◊ Gills white or buff

• Spores broadly elliptical 5–7 × 4–5μ *L. quinamana*

•• Spores narrower

// Pileus over 2 cm. diameter . *L. bakeri*

// // Pileus seldom exceeding 1 or 1·5 cm. *L. erinana*

2. Spores non-amyloid, remaining yellowish in Melzer's reagent

a. Gills adnate

α Squamules of large rounded cells with brown sap *L. sipariana*

β Squamules of narrower short celled hyphae *L. armillarioides*

b. Gills free

α Pileus mealy, white to buff . . . . *L. pseudogranulosa*

β Pileus fibrillose, ochraceous . . . *L. ochraceo-aurantiaca*

γ Pileus with purplish-brown squamules . . *L. subcristata*

I. *Ring absent.* Subgenus *Hiatula* Fr. Nova Acta Soc. Sci. Upsal. Ser. 31 p. 27, 1851.

Type species : *Agaricus discretus* Fr.

Hiatula was defined by Fries as " Pileus tenuissimus, epelliculosus, e dorsis lamellarum junctis formatis, expansus veliformi-fissus, ut in tenerrimis Coprinis, at non diffluens et sporidia alba ! Novum crederem genus, nisi inter Coprinos eadem differentia rediret. Pertinet enim ad Leucosporum seriem, sed inter illos insertum hanc interrumperet, licet habitus Mycenae."

The type collection of *Ag. discretus* was made by Benzon in the then Danish West Indies (now American Virgin Is.) and was preserved in alcohol. It cannot now be traced at Uppsala or Copenhagen. Unfortunately the West Indian Agarics with Coprinus-like pilei but free white gills fall into two distinct groups, one with red-amyloid, the other with blue-amyloid spores and it is impossible to be certain to which of these *Ag. discretus* belonged. However *Hiatula* has long been associated by mycologists with *Lepiota* and I have accordingly used it here for the red-amyloid species and relegated the blue-amyloid group temporarily to *Mycena*. The description of *Ag. discretus* with stipe " 1½ unc. longus, basi ½ unc usque, apice 2 lin. crassus " is suggestive of *Lepiota cepaestipes*.

Lepiota minima (*Berk.*) *Dennis*, comb. nov.

Hiatula minima Berk. in Ann. Mag. Nat. Hist. ser. 2, **9,** 193 (1852).

Leptomyces minimus (Berk.) Murrill in N. American Flora **9,** 309 (1916).

Pileus 2–3 cm. diameter hemispherical with a flattened umbo, plicato-striate half-way to the disc, white, dotted with minute dark purplish-brown squamules which become confluent at the disc ; flesh very thin,

white soft, becoming pink and deliquescing with age ; gills equal, crowded, thin, about 2 mm. wide, remote from the stipe ; stipe equal, curved, 2 mm. thick, hollow, smooth, white, becoming purplish-brown at the base. Spores elliptical, 6-10 × 5–7μ hyaline, red-amyloid, basidia 4-spored, separated by globose paraphyses ; cheilocystidia thin-walled, hyaline, ventricose, 45–50 × 13–15μ ; pileus surface of more or less parallel, loose, hyaline hyphae 12–15μ broad with septa about 200μ apart ; squamules formed of elliptical cells about 30–40 × 10–15μ with thin smooth walls and dark purplish-brown sap, borne in the tips of slender hyaline hyphae. Gregarious on stumps in forests. Fig. 2. Collections seen : Trinidad, *Naranja*, 27.XI.1949, *Dennis* 389 ; San Domingo, *Sallé* 33 (Typus).

Lepiota nigropunctata *Dennis*, spec. nov.

Pileus 10–12 mm. latus, subglobosus cum umbone acuto, griseus, dein conico-expansus, albus, griseo-punctatus, umbone griseo ; caro alba, tenuis, fibrosa ; lamellae albae, liberae ; stipes cylindricus, albus, glaber, fistulosus, annulo obsoleto, mycelio albo ; sporae ellipticae, 4·5–5 × 3–3·5μ, pseudoamyloideae ; cheilocystidiae ventricosae 30–40 × 8–10μ Ad dejecta plantarum, Sangre Grande, Trinidad. *Dennis* 154, Typus. Fig. 3.

var. *lutea* var. nov.

A typo differt stipite luteo. St. Joseph, Trinidad, *Dennis* 76, Typus.

Fig. 2. *Lepiota minima*. Cheilocystidium (C), spore and cells of the squamules × 660.

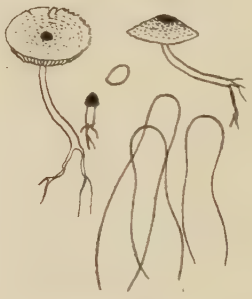

Fig. 3. *Lepiota nigropunctata*. Spore and cheilocystidia × 660.

Lepiota roseolamellata *Dennis*, spec. nov.

Pileus 1 cm. latus, expansus, minute umbonatus, plicato-striatus, albus dein roseus ; caro tenuis, fibrosa ; lamellae confertae, arcuatae, liberae, albae dein rosae ; stipes cylindricus, undulatus, albus, tenuis, annulo obsoleto ; sporae ellipticae 5·5–7 × 2·5–3μ, pseudoamyloideae, hyalinae; cheilocystidiae vesiculosae, 16–25 × 12μ. Ad lignum putridum in ilvis, St. Joseph, Trinidad. *Dennis* 179A, Typus. Fig. 4.

2. Membranous or fibrous ring present. Subgenus *Lepiota*, synonym *Macrolepiota* Singer Pap. Mich. Acad. Sci. **32,** 141 (1948) as genus.

Type species *Ag. procerus* Scop. ex Fr. *Macrolepiota* is an obligate synonym of *Lepiota* as typified by Donk and as understood in this paper. Singer proposed *Ag. clypeolarius* Fr. as the type species of *Lepiota* and hence found it desirable to erect a new genus for the group of *Ag. procerus*.

Fig. 4. *Lepiota roseolamellata*. Spores and cheilocystidia × 660.

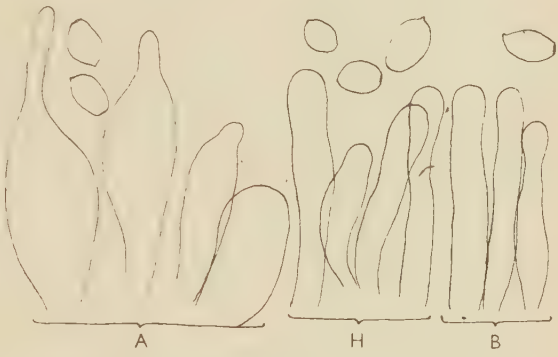

Fig. 5. Cheilocystidia and spores of *Lepiota americana*, Newfield, New Jersey (A), *L. hortensis* typus (H) and Baker 1482 (B), all × 660.

Lepiota hortensis *Murrill* in N. American Flora **10,** 59 (1914).

Pileus conico-campanulate, expanding to 8 cm., with a large rounded umbo, whitish with large, adpressed, tawny-olive squamules, margin slightly striate ; flesh whitish, becoming brownish vinaceous when exposed to the air ; gills rather crowded, broad, free, white ; stipe slightly attenuated upwards, 5-8 mm. thick, hollow, smooth, whitish ; ring superior, fixed, thin, membranous, white. Spores elliptical or ovoid, with a germ pore, 9–11 ⁄ 5·5–6μ, red-amyloid, cheilocystidia cylindrical, obtuse or slightly capitate, hyaline, thinwalled, up to about 50 × 8μ. In groups and rings in pastures. Collections seen :— Trinidad : St. Augustine, *R. E. D. Baker* 1482, 27.VII.1947 ; U.S.A. : Auburn, Alabama, *F. S. Earle*, 2.IX.1899 (Typus).

Baker and Dale (1951) on my advice recorded their 1482 as *L. americana* (Peck) Sacc. This determination was based on Murrill's key to *Lepiota* in N. American Flora, where *L. hortensis* is included among non-staining species. Since then I have compared Baker 1482 with the type of *L. hortensis* and with authentic material of *L. americana* from Newfield, New Jersey, sent by Peck to Kew. Apart from the degree of staining in the dried pileus the two seem separable by the shape of the cheilocystidia which are ventricose or beaked in *L. americana*. On this basis the Trinidad fungus is now referred to *L. hortensis*. Fig. 5.

2 B. *Fragile species, spores elliptical with a prominent germ-pore — Leucocoprinus Pat. (as genus).*

Lepiota lutea (*Bolt. ex Secr.*) *Godfrin* in Bull. Soc. Myc. France **13,** 33 (1897).

Agaricus cepaestipes Sow. ex Fr. var. *lutea* Bolt. ex Secretan, Mycogr. Suisse I, 56 (1833).

Agaricus luteus (Bolt. ex Secr.) Berk. in Intell. Observer **7,** 1865.

Agaricus cepaestipes Sow. ex Fr. var. *flos sulphuris* (Schnitzlein) Oudemans Arch. Néerland. Sci. exact. Nat. **2,** 19 (1867).

Pileus 4–5 cm. across, ovate, then conical with a rounded umbo or expanded, closely plicato-striate halfway to the disc, picric yellow, bearing loose, scattered, mealy concolorous scales ; flesh thin, soft, concolorous ; gills crowded, thin, broad, free, sulphur yellow ; stipe with a prominent swollen base 5–6 mm. thick, equal and about 3 mm. thick above the ring, hollow, concolorous with the pileus, ring concolorous, membranous or fragmentary, stipe scurfy below. Spores ovoid, with a germ pore, red-brown in Melzer's reagent, thin-walled, size rather variable (6,–7–10–(11) × 5–6·5 (–7)μ ; cheilocystidia of two kinds, balloon shaped 15μ across and flask-shaped about 60 × 15μ, thinwalled ; squamules of the pileus formed of septate hyphae about 8μ wide.

On logs and decaying wood. Fig. 6.

American collections seen :—Trinidad : Non Pareil, Sangre Grande, 11.X.1949, *Dennis* 150 ; Botanic Garden, Port of Spain, 25.XI.1949, *Dennis* 150A ; Tobago : Dec. 1949 ; Cuba : Herb. Berk. ; Bahamas : Nassau, *L. J. K. Brace* 1926 ; Nicaragua : Granada, Örsted's fig. 9 now at Copenhagen and cited by Fries (1851) as *Ag. cepaestipes*. Numerous other West Indian collections in the *L. cepaestipes* cover at Kew may be *L. lutea*. The colour fades and dried pressed specimens can hardly be distinguished with certainty.

Lepiota licmophora (Berk. et Br.) Sacc. from Ceylon is evidently a related species. Petch (1910) distinguished the two thus : *L. lutea* (as *L. cepaestipes*) spores subglobose, 5–7 × 4–5μ ; *L. licmophora* spores 11–13 × 7–8μ. The latter figure agrees exactly with the spores of the type collection at Kew but the former is small for *L. lutea* as found in European hot-houses, two recent collections in the houses at Kew yielded spores 6–9 × 5–6 and 8–11 × 6–7μ respectively. Other measurements by European authors are : Godfrin 1887 spores 6–7μ long, elliptic-globose ; Boudier 8–10 × 5–7μ ; Konrad and Maublane 7–8·5 × 5–6μ ; Lange 8–10 × 5–6μ. The Trinidad fungus thus agrees better with the form found in European hot houses than with that native to Ceylon. This and the two following species are referable to *Leucocoprinus* Pat. 1888.

Lepiota cepaestipes (*Sow. ex Fr.*) *Quél.*, Champ. Jura et Vosges 35 (1872).

Agaricus cepaestipes Sow. ex Fr., Syst. myc. I, 280 (1821).

Agaricus rorulentus Panizzi in Comm. della Soc. Critt. Ital. 172 (1861).

Lepiota rorulenta (Panizzi) Barla in Bull. Soc. Myc. France **9,** 117 (1886).

Agaricus cheimonoceps Berk. et Curt. in Journ. Linn. Soc. Bot. **10,** 283 (1869).

Lepiota cheimonoceps (Berk. et Curt.) Sacc., Syll. Fung. 5, 66 (1887).

Leucocoprinus cepaestipes (Sow. ex Fr.) Pat., Tab. analyt. fung. Fasc. 7, 45 (1889).

Pileus up to 8 cm. diameter, at first ovoid, then conical with a rounded umbo, becoming campanulate or expanded, plicato-striate at the margin only, pure white, becoming cream or buff at the disc only, covered with loose mealy squamules ; flesh soft, moderately thick, white ; gills crowded, thin, broad, free, white ; stipe with a fusiform base 6–8 mm. thick, equal and 2–3 mm. thick above, hollow, white or cream coloured, ring membranous, moveable, white, soon breaking up, stipe mealy below the ring. Spores ovoid with a germ pore, red-brown in Melzer's reagent, size variable, most 7–10 × 5–6·5μ. Fig. 7.

Fig. 6. *Lepiota lutea.* Dennis 150, cheilocystidia and spore × 660.

Fig. 7. *Lepiota cepaestipes.* Baker 1429, from original drawing by Prof. Baker.

On the ground, more or less gregarious.

Collections seen :—Trinidad : St. Augustine 12.V.1947 and 31.V.1947, *R. E. D. Baker* 1429 ; Dominica : on a palm log, Botanic Garden, *E. M. Wakefield* 25, 12.XI.1920 ; Jamaica : on manure, East Street, Kingston, I.XI.1944, Jamaica Institute F 108 ; Cuba ; *Wright* 129 (Typus of *L. cheimonoceps*).

Hiatula squamulosa Mont. is a very similar fungus which apparently lacks the swollen base to the stipe, though the stipes of the type collection are now imperfect. It has spores 7–9·5 × 5–6·5μ with a germ pore. Similar collections at Kew are Jenman 7164, gardens in Georgetown, British Guiana, May 1896 ; and the two Cuban collections Wright 112 and 116 published by Berkeley and Curtis as *L. clypeolaria*, which have spores 7–10 × 5·5–7μ.

Agaricus cretaceus Bull. t. 374 is usually cited as a synonym of *L. cepaestipes* but this must be an error for Bulliard figured four young sporophores with mushroom-like pilei quite distinct from the characteristic ovate pileus of young *L. cepaestipes* as shown in Sowerby t. 2. Locquin (1945) has identified Bulliard's fungus with *L. naucina* sensu *Cooke*. Godfrin's attempt to distinguish the white *L. cepaestipes* from *L. lutea* by its spores being 10–11μ long instead of 6–7μ long is not borne out by subsequent authors or by the measurements given above under *L. lutea*. Some published measurements of spores from sporophores identified as the white *L. cepaestipes* are :—Spegazzini (1899) 10–12 × 7–8μ ; Patouillard (Tab. Anal. 612) 10μ ; Rea 6–7 × 4–5μ. Lange 6–8·5 × 4·75–5·5μ. These evidently come from two distinct species. In fact *L. cepaestipes* seems to be one of those old established species which everyone talks about and no one precisely knows. The type has not been preserved and in examining the older British collections under this name one is handicapped by the tendency of collectors to use *L. cepaestipes* for both the yellow and white forms without indicating pileus colour on the label. The yellow colour soon disappears in dried material. I have assumed, however, that collections labelled *Ag. cretaceus* were white. Through the kindness of Mrs. Balfour Browne I have been able to examine spores of four so labelled at the British Museum. These and two in the British collection at Kew yielded the following data :

1. Veitches, 17.V.1870, W. G. Smith—spores 5–6·5 × 3·5–4μ.
2. Henbury Hill Pine Pits 1847, C. E. Broome—spores 8–10·5 × 5–7μ.
3. Batheaston 1874, C. E. Broome—spores 8–11·5 × 4·5–7μ.
4. Elmhurst 2.VII.1874 C. E. Broome—spores 8–10 × 5–6·5μ.
5. At Kew—spores 7–9 × 5–6·5μ.
6. At Kew—spores 8–12 × 5·5–7μ.

Numbers 2, 4, 6 and probably 3 seem to represent the same species which I take to be *Ag. cepaestipes*. No. 1 is something very different, with pileus only 1 cm. diameter. No. 5 bore minute brown squamules whereas Sowerby's figure was white throughout. It may be the fungus called *L. cepaestipes* by Lange but is not, I think, that species. In Trinidad the fungus represented by Baker 1429 is evidently a species of the first rains and I have not seen it fresh. Whilst I am unable at present to distinguish between *L. cepaestipes* and *L. cheimonoceps*, both with bulbous stipes, it is desirable for Mycologists in the West Indies to study the Lepiotas of this group in the fresh condition and to ascertain if those on the ground and on decaying logs are the same species. They may also be able to decide if there is a third species, corresponding to *H. squamulosa* Mont., terrestrial but with non-bulbous stipe. (But see *L. subclypeolaria* p. 471).

Lepiota muticolor *Murrill* in N. American Flora **10,** 58 (1914).

Pileus 4 cm., conico-campanulate becoming expanded, Mars brown, paler at the margin, surface minutely tomentoso-squamulose ; flesh thin, light pinkish cinnamon ; gills broad, crowded, free, cinnamon, drying almost black ; stipe equal above a slightly swollen base, fibrillose, concolorous with the pileus, ring membranous, broad, persistent. Pileus surface of loose inflated hyphae with terminal cells about 50 × 12μ,

cheilocystidia hyaline, ventricose, thinwalled, about 40 × 15μ, spores elliptical with rather thick walls, becoming light brown with age on the gills, 8–12 × 5·5–8μ, germ pore large and conspicuous, strongly red-amyloid. Sporophores borne singly on rotting logs.

L. subdryophila Murr. (=*L. truncicola* Murr.) from Florida seems very similar.

Collections seen : Trinidad : on log, Non Pareil, Sangre Grande 11.X.1949, *Dennis* 169 ; Alabama : on hickory log in Palmetto swamp near Auburn, *F. S. Earle* 1.IX.1899 (Typus) The Trinidad sporophores were somewhat overmature when gathered. According to Murrill the young pileus is white towards the margin, becoming rosy-isabelline, gills and stipe are also said to be white when young.

2C. *Medium to small species with striate sulcate pileus and scattered squamules.*

Fig. 8. *Lepiota subclypeolaria.* Dennis 12a, cheilocystidia and spores × 660.

Lepiota subclypeolaria (*Berk. et Curt.*) *Sacc.*, Syll. Fung. **5,** 67 (1887). *Agaricus subclypeolarius* Berk. et Curt. in Journ. Linn. Soc. Bot. **10,** 283 (1869).

Pileus at first ovate with a flat disc, becoming conical then flattened with a broad umbo, up to 5 cm. diameter, white with clay coloured umbo and scattered minute, recurved, concolorous or paler squamules, plicato-striate halfway to the umbo ; flesh thin, soft, white ; gills of two lengths, free, 2–4 mm. wide, rather crowded, white, margin denticulate ; stipe 5–6 mm. thick at the base, attenuated upwards to 3 mm. smooth, hollow, white ; ring superior, erect, fixed, membranous, smooth, white. Spores elliptical, 6–8 × 3·5–5μ, deeply red-amyloid, cheilocystidia thinwalled, cylindrical, obtuse, 60–70 × 10–15μ, cohering in groups to form the denticulate margin, squamule hyphae about 7μ wide. Solitary to subcaespitose amongst grass under trees. (Fig. 8). Collections seen :— Trinidad : St. Augustine on lawn 21.IX.1949, *Dennis* 12 ; under Saman tree 24.IX.1949, *Dennis* 12 A ; Cuba : *Wright* 131. (Typus).

L. longistriata Peck is possibly a synonym. *L. flavodisca* Murrill is similar with spores 6–7 × 4μ but lacks the large cheilocystidia and minute scales on the pileus. Berkeley's herbarium contained four collections labelled *Ag. (Lepiota) subclypeolaria*, one from Ceylon, three from Cuba. The Ceylon material, Thwaites 37, has been redetermined by Petch as *L. zeylanicus*. Two of the Cuban collections were published as *L. clypeolaria* and have been discussed above under *L. cepaestipes*.

Lepiota micropholis (*Berk. et Br.*) *Sacc.*, Syll. Fung. **5,** 61 (1887).
Agaricus micropholis Berk. et Br. in Journ. Linn. Soc. Bot. **11,** 505 (1871).

Pileus up to 2·5 cm. diameter, conical, becoming flattened with a low broad umbo, plicato-striate to the disc, white, dark purplish-brown to black at the disc, elsewhere dotted with minute adpressed concolorous squamules composed of prostrate coherent fibrils ; flesh very thin, soft, white ; gills 2–2·5 mm. broad, free, white ; stipe slightly attenuated upwards, 1–2 mm. thick, smooth, white, hollow, ring superior, collar-like, membranous, white, persistent. Spores ovoid, with one large oil drop, red amyloid, 4·5–6 × 3·5–4μ, cheilocystidia cylindrical, hyaline, thinwalled, about 30 × 8μ, squamule hyphae 8–10μ wide with purplish-gray sap.

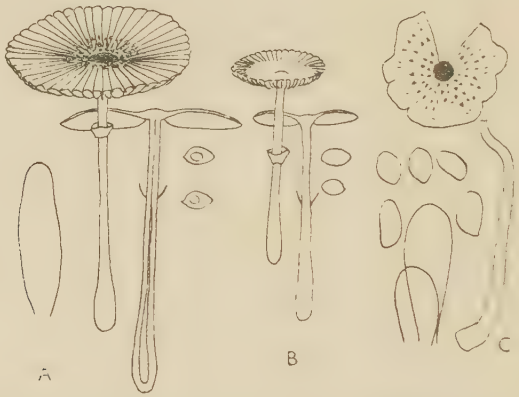

Fig. 9. A. *Lepiota micropholis*, Dennis 294a ; B. *L. micropholis* var. *lactea*, Dennis 378 ; C. *L. tepeitensis*, typus. Cheilocystidia and spores × 660.

Fig. 9A. Sporophores terrestrial, arising from a white mycelium, in plantations and forests.

Collections seen :—Trinidad : St. Joseph, 2.IX.1947, *R. E. D. Baker* 1556 ; Botanic Gardens, Port of Spain, 11.XI.1949, *Dennis* 294A ; Quinam, 4.XI.1949, *Dennis* 294. Venezuela : Rio Chacaito, 18.XI. 1949, *Dennis* 294 B.

L. montagnei Kalchbr. var. *congolensis* Beeli, superficially very similar, is said to have spores 7–9 × 4–5 ; *L. tepeitensis* Murr. differs in its nonsulcate pileus (Fig. 9c).

var. **lactea** (*Murr.*) *Dennis*, stat. nov.

Lepiota lactea Murrill in Mycologia **3,** 81 (1911).

Differs from the type in the pileus being pure white throughout, free from squamules, spores 4–5 × 3–4μ. Fig. 9D.

Collections seen :—Trinidad : under trees, Queen's Park Savanna, Port of Spain, 25.XI.1949, *Dennis* 378, five sporophores, all pure white ; Cuba : in banana field, Santiago de las Vegas, 17.VI.1904, *F. S. Earle* 75 (Typus).

2 D. *Pileus not plicato-striate, surface hyphae more or less prostrate or interwoven.*

**Squamules conspicuous, margin appendiculate.*

Lepiota tobagensis *Dennis* spec. nov.

Pileus 6 cm. latus, hemisphaericus dein convexus, " Mars Orange ", fibrilloso-squamulosus, margine appendiculatus ; caro crassa, roseo-bubalina ; lamellae confertae, 6–7 mm. latae, adnexae, bubalinae dein brunneae ; stipes curtus, cylindricus, solidus, roseo-bubalinus dein brunneus, infra annulum floccoso-squamulosus ; annulus superus, evanescens ; sporae ellipticae 4–4·5 × 2·5μ, luteae, pseudoamyloideae ; cheilocystidiae cylindrico-clavatae, hyalinae, 15 × 5μ ; Ad terram, Mt. Dillon Trace, Tobago. *Dennis* 427, Typus. This species might be sought in " *Armillaria* " near *A. aurantia* (Schaeff. ex Fr.) Quél. = *Tricholoma aurantium* (Schaeff. ex Fr.) Ricken.

Fig. 10. *Lepiota* cf. *gracilis*. Spores and cheilocystidia × 660.

Lepiota *cf.* **gracilis** *Peck* in Bull. Torrey Bot. Club **26,** 63 (1899).

Pileus conico-campanulate, 1.25 cm. diameter, drab gray, squamules triangular, adpressed with recurved tips, fuscous, margin not striate, appendiculate with fuscous fragments of the veil ; flesh thin, white ; gills rather crowded, of two or three lengths, 2 mm. wide, becoming pinkish, free ; stipe 1–2 mm. thick, slightly attenuated upwards, drab gray, loosely fibrillose and clothed below the ring with dark squamules like those of the pileus, hollow, ring superior, fibrillose, whitish, poorly developed. Spores elliptical, 6–7 × 3–4μ, red amyloid ; cheilocystidia subcylindrical hairs, varying from slightly ventricose to slightly capitate, 15–20 × 10–12μ, squamule hyphae brown, varying from 4–12μ diameter

Solitary on the ground in forests. Fig. 10.

Collections seen :—Trinidad : Quinam, 4.XI.1949, *Dennis* 289. *L. gracilis* was described from Canadian material and as I have been unable to examine the type it is with some hesitation that I refer to it my 289, from description only.

***Surface of tomentose hyphae more or less torn into squamules.*

Lepiota quinamana *Dennis* spec. nov.

Pileus 4 cm. latus, hemisphaericus dein expansus, centro depresso, aurantiaco-cinnamomeus, tomentosus dein innato-squamulosus ; caro tenuis, alba ; lamellae confertae, 4 mm. latae, roseo-bubalinae, liberae ; stipes apicem versus subattenuatus, fistulosus, vinaceo-cinnamomeus, minute tomentosus ; annulus superus, membranaceus, albus, margine cinnamomeus ; sporae subglobosae 5–7 × 4–5μ, pseudoamyloideae ; cheilocystidiae ventricosae, 38–60 × 7–10μ. Ad terram in silvis. Quinam, Trinidad, *Dennis* 288, Typus. Fig. 11. Superficially this resembles *Lepiota azalearum* apart from its non-scaly stipe, but the spores of the two species are quite distinct.

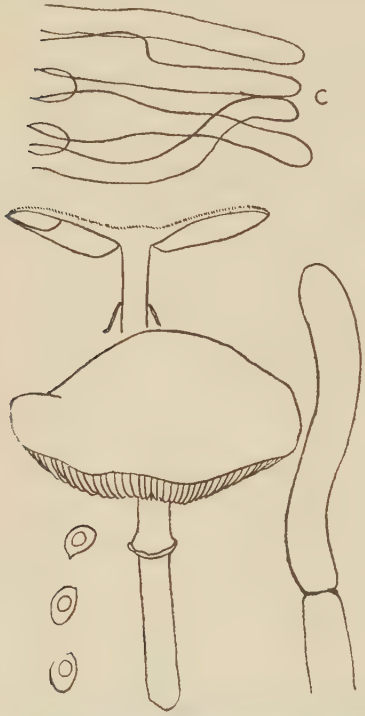

Fig. 11. *Lepiota quinamana.* Cheilocystidia (C), spores and hair of the pileus × 660.

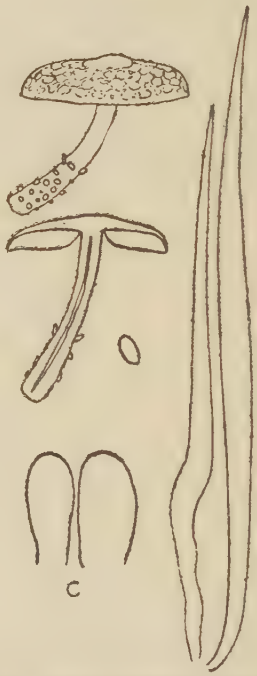

Fig. 12. *Lepiota azalearum.* Dennis 306, spore and cheilocystidia (C) × 660, hairs of the pileus × 330.

Lepiota azalearum (*Murr.*) *Dennis* comb. nov.

Cortinellus azalearum Murr. in Lloydia 5, 137 (1942).

Pileus 2 cm. diameter, convex with an ill-defined umbo, testaceous, walnut-brown at the disc, surface tomentose, the fibrils indistinctly tufted ; flesh white, thin ; gills crowded, of 2–3 lengths 2–3 mm. wide, cartridge buff ; stipe slightly attenuated upwards, about 3 mm. thick below, hollow, vinaceous pink, with floccose testaceous squamules below ; ring fibrous, evanescent. Spores elliptic-cylindric 4–6 × 2·5–3μ, red-amyloid ; cheilocystidia balloon-shaped, about 20 × 8–12μ ; fibrils of the pileus surface reddish-brown, pointed, 10–14μ wide. On the ground in secondary bush. Fig. 12.

Collection seen :—Trinidad : Erin, 6.XI.1949, *Dennis* 306.

Lepiota cf. alluviina (*Peck*) *Morgan* in Journ. Myc. **12,** 243 (1906).

Agaricus alluviinus Peck in Ann. Rept. New York State Mus. **35,** 157 (1884).

Pileus 4 cm. diameter, expanded with a prominent obtuse umbo, white with a pinkish buff cuticle continuous over the umbo, cracked into small adpressed squamules elsewhere, not striate ; flesh thin, soft, white ; gills crowded, 3–4 mm. broad, free, white, the edge minutely denticulate, apt to stain reddish ; stipe slightly attenuated upwards from 5 to 3 mm. polished, fibrous, twisted, white, hollow ; ring superior, membranous, persistent, white. Spores elliptical, 5·5–8 × 4–5·5μ, red-amyloid ; cheilocystidia cylindrical or slightly ventricose, obtuse or capitate hairs up to 30 × 15μ ; pileus cuticle composed of matted, colourless prostrate hyphae 6–10μ wide. Solitary on forest floor. Fig. 13.

Collections seen : Trinidad, Quinam, 4.XI.1949, *Dennis* 290.

The above identification is based on the published description only. Application to borrow the type from Albany has been unsuccessful. This fungus invites comparison with *L. inebriata* (Berk. et Br.) Sacc. from Ceylon the type of which has almost identical spores and is superficially similar but had a striate margin and grew on wood. Petch regards it as a synonym of the terrestrial *L. zeylanicus* (Berk.) Sacc. which has spores 7–12 × 5–7μ.

Fig. 13. *Lepiota* cf. *alluviina.* Spores and cheilocystidia × 660.

Lepiota rubrotincta (*Peck*) *Peck* in Ann. Rept. New York State Mus. **44,** 179 (1892).

Agaricus rubrotinctus Peck in Ann. Rept. New York State Mus. **35,** 155 (1884).

On the ground under trees. This species has been well figured by Baker and Dale (1951 Plate I fig. b.).

Collection seen : Trinidad, St. Augustine, *R. E. D. Baker* 1472, 26.VI. 1947.

Type not available for examination. *L. rubriceps* Murr. 1939 may be a synonym.

****Pileus surface completely smooth.*

Lepiota pseudoroseola *Dennis*, spec. nov.

Pileus 1·5 cm. latus, convexus, miniatus, umbone obscuro, glaber ; caro alba, tenuis ; lamellae confertae, albae, liberae, 2 mm. latae ; stipes deorsum incrassatus, albus, fistulosus, annulus superus, membranaceus, firmus, exiguus, albus ; sporae ellipticae, 5–6·5 × 3μ, pseudoamyloideae.

Typus : ad terram in sylvis, Rio Chacaito, Venezuela, 18.XI.1949, *Dennis* 393. Fig. 14.

L. roseola Beeli from Belgian Congo is very similar but is said to have spores 6–8 × 4μ with an apical germ pore, which is lacking in my 393. *L. carminea* Pat & Gaill. was described as having adnate gills, a red annulus and a scaly pileus.

Fig. 14. *Lepiota pseudoroseola.* Spores × 660.

Fig. 15. *Lepiota sordescens.* Dennis 191, spores and cheilocystidia × 660.

Lepiota subamanitiformis *Dennis*, spec. nov.

Pileus 5 cm. latus, convexus, pallide brunneus, umbone obscuro, radiato-fibrillosus, glaber ; caro crassa, alba ; lamellae confertae, 5 mm. latae, albae, liberae ; stipes deorsum incrassatus bubalinus, supra annulum albus, farctus ; annulus superus, membranaceus, firmus, exiguus, albus, margine brunneus ; sporae ellipticae, 7–8 × 4–5μ, pseudoamyloideae. Ad ramenta putrida, Sangre Grande, Trinidad, *Dennis* 155, Typus.

Lepiota sordescens (*Berk. et Curt.*) *Sacc.*, Syll. Fung. **5,** 66 (1887).

Agaricus sordescens Berk. et Curt. in Journ. Linn. Soc. Bot. 10, 283 (1868).

Pileus about 3 cm. diameter, becoming flattened and depressed at the disc, surface dry, white, shining, disc almost black, surrounded by small ill-defined innate fuscous squamules, margin neither striate nor sulcate ; flesh thin, white in the pileus, brown in the stipe ; gills crowded, of two

lengths, 3 mm. broad, rounded behind and adnexed, white, drying dark gray-brown ; stipe slender, equal, 2 mm. thick, hollow, white-fibrillose above, with innate fuscous squamules below, ring evanescent. Spores ellipsoidal, 5–6 × 3μ red-amyloid ; basidia 4-spored, 6μ wide with short sterigmata ; cheilocystidia ventricose, obtuse, hyaline hairs about 40–45 × 8μ ; pileus squamules a network of prostrate hyphae 7–8μ wide with dark brown granular contents. Fig. 15.

Collections seen :—Trinidad : Bamboo plantation, St. Joseph, 18.X. 1949, *Dennis* 191 ; Cuba : *Wright* 24 and 71. (*Typus*).

The types are mouldy and yielded no basidiospores but in gross morphology and darkened gills they agree well with *Dennis* 191. Murrill was certainly wrong in referring *L. sordescens* to *L. cretacea* as a synonym.

Lepiota rimosa *Murrill* in Mycologia **3,** 85 (1911).

Pileus convex with a broad low umbo, less than 2 cm. diameter, pale smoke-gray, cuticle hair-brown, of prostrate hyphae soon torn apart to form innate, minute, ill-defined squamules, margin not striate ; flesh thin, soft, white ; gills crowded, of two lengths, 2–4 mm. wide, pale grayish vinaceous, abruptly rounded behind, free ; stipe equal above the slightly swollen base, 1–2 mm. thick, confluent with the pileus, smooth, vinaceous-buff to avellaneous, hollow ; ring superior, whitish, fixed, membranous. Spores elliptic-fusiform, 5·5–7 × 4–4·5μ red-amyloid ; basidia 4-spored, gill edge fertile. Fig. 16.

Fig. 16. *Lepiota rimosa.* Dennis 2a, spore × 660.

Solitary amongst grass on lawns or attached to fallen vegetable debris.

Collections seen :—Trinidad, St. Augustine 21.IX.1949, *Dennis* 2 ; same locality 30.XI.1949, *Dennis* 2A ; Cuba, Santiago de las Vegas, *F. S. Earle* 110 (Typus).

2 E. *Pileus surface a pile of ± erect short hyphae, usually cracked into dot-like squamules.*

**Spores laterally apiculate.*

Lepiota subgranulosa *Murrill* in Mycologia **3,** 83 (1911).

Pileus 1–1·5 cm. diameter, conical, then expanded, tawny, surface very minutely scurfy ; flesh thin, buff, tawny in the stipe ; gills crowded, broad, of three lengths, free, buff ; stipe concolorous with the pileus, loosely fibrillose, brittle, hollow, 1·5–2 mm. thick, ring fibrous, almost disappearing, superior. Spores elongated with a prominent lateral apiculus and often a protuberance on the opposite side, deep red-amyloid 7–8 × 3–3·5μ, print white, cheilocystidia cylindrical or slightly capitate, about

30 × 6μ ; pileus surface covered with erect clavate hairs 45–70 × 14–20μ, borne on prostrate hyphae 5–8μ wide, walls red-brown throughout.

Gregarious on dead wood, arising from white mycelial strands.

Collections seen : Trinidad, Botanic Garden, Port of Spain, 11.XI. 1949, *Dennis* 327 ; Mexico : Xuchiles near Cordoba, 17.1.1910, *W. A. and E. L. Murrill* 1146 (Typus). Fig. 17. This species seems closely related to *L. castanea* Quél. and *L. ignicolor* Bres. It may even be identical with the latter but Bresadola's figure of the spores does not show the curious swelling opposite the apiculus and *L. ignicolor* has a tawny strigose base not noted in Dennis 327.

var. *majus* nov.

Differs from the type in being slightly larger, brightly ochraceous, with spores 8–11·5 × 3–4μ.

Collection seen : Venezuela, on ground in forest, Rio Chacaito, 18.XI.1949. *Dennis* 351 (Typus). *L. truncatispora* Murr. has similar hairs and spores but is said to have white stipe and gills.

***Spores elongated, cylindric-fusiform.*

Fig. 17. *Lepiota subgranulosa.* Dennis 327, cheilocystidia (C), spores and hairs of the pileus × 660.

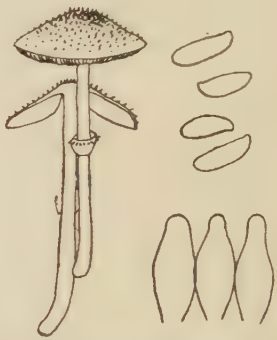

Fig. 18. *Lepiota cultorum.* Dennis 93, spores and cheilocystidia × 660.

Lepiota cultorum (*Berk. et Curt.*) *Sacc.*, Syll. Fung. **5,** 35 (1887).

Agaricus cultorum Berk. et Curt. in Ann. Mag. Nat. Hist. ser. 2, **12,** 418 (1853).

Pileus conico-campanulate, expanding, 2 cm. diameter, avellaneous, covered with minute, erect, pointed, vandyke-brown squamules ; flesh thin, vinaceous-buff ; gills crowded, 2 mm. wide, free, tilleul buff ; stipe equal, 2 mm. thick, smooth, avellaneous ; ring median, fixed, membranous, collar-like, white, margin decorated with a row of vandyke-brown squamules. Spores elongated pip-shaped, 9–13 × 4–4·75μ, red-amyloid, cheilocystidia thinwalled, hyaline, ventricose, about 20 × 8μ ; squamule hyphae thin-walled, parallel, 8–10μ wide, with purplish-brown contents. Solitary on the ground in plantation litter. Fig. 18.

Collections seen : Trinidad ; River estate, Diego Martin, 29.IX. 1949, *Dennis* 93 ; South Carolina, *Curtis* 2828 (Typus).

Lepiota floralis (*Berk. et Rav.*) *Sacc.*, Syll. Fung. **5,** 51 (1887).

Agaricus floralis Berk. et Rav. in Ann. Mag. Nat. His. Ser. 2, **12,** 418 (1853).

Pileus conico-campanulate, soon becoming flattened with a broad, low umbo, up to 4 cm. diameter, light buff, covered with minute, scurfy, ochraceous-buff squamules ; flesh thin, whitish under the cuticle, becoming honey yellow with age ; gills rather crowded, 3–4 mm. broad, of two lengths, free, white then ivory yellow ; stipe equal, 3–5 mm. thick, hollow, concolorous with the pileus, becoming ochraceous-tawny with loose white fibrils below the superior, fibrous, evanescent ring.

Fig. 19. *Lepiota floralis.* Dennis 21, cheilocystidium (C), spores and hair of the pileus × 660.

Spores elliptic-fusiform with a large, curved basal apiculus, red-amyloid, (6)–8–10·5 (–12) × 2·75–3·5–(4) μ, cheilocystidia cylindrical or slightly ventricose, thin-walled, hyaline, about 30 × 10–12μ ; pileus squamules formed of somewhat prostrate loose septate fibrils 10–16μ thick, with clamp connections. The colour is in or on the cell wall On the ground in plantations and forests. Fig. 19.

Collections seen : Trinidad : River Estate, Diego Martin, 21.XI. 1949, *Dennis* 21 ; at about 1800′ on northern range of Arima 25.IX.1949 ; Siparia Forest Reserve 5.XI.1949, *Dennis* 21 A ; South Carolina, Aiken, July, *Ravenel* 1011 (Typus) ; same locality, Ravenel Fungi Am. Exsic. 401.

Berekley and Curtis, record of the species from Cuba is an error, the specimen cited, Wright No. 1, has spores 3·5–4 × 2·5μ.

Fig. 20. *Lepiota abruptibulba.* Dennis 278, spore and hairs of the pileus × 660.

Lepiota abruptibulba *Murr.* in Mycologia **3,** 88 (1911).

Pileus convex with a broad flat umbo, 7 cm. diameter, completely clothed with velvety pile, russet to cinnamon-brown, margin striate ; flesh thick, white under the cuticle in the pileus, avellaneous in the stipe ; gills crowded, 8 mm. broad, free and remote from the stipe ; white ; stipe with a bulbous base 1·5 cm. thick, attenuated upwards to 4 mm., avellaneous above the ring, russet and velvety below, hollow, easily detached from the pileus ; ring superior, funnel-shaped, moveable, membranous, whitish above, velvety and russet below. Spores elliptical 5–6 × 4–4·5μ, red-amyloid ; hairs of the pileus inflated, thinwalled, obtuse, 100–140 × 11–14μ. Solitary, terrestrial. Fig. 20.

Collections seen : Trinidad : Siparia Forest bungalow, on sandy soil under Maximiliana palm on forest edge, 3.XI.1949, *Dennis* 278 ; Cuba, (Typus).

L. puttemansii Pat. Bull. Soc. Myc. France XXXVII p. 81, 1921 is evidently very similar but double the size.

****Spores elliptical.*

Lepiota biornata (*Berk. et Br.*) *Sacc.*, Syll. Fung. **5,** 54 (1887).
Agaricus biornatus Berk. et Br. in Journ. Linn. Soc. Bot. **11,** 502 (1871).

FIG. 21. *Lepiota biornata.* Cheilocystidia (C), spore and hair of the pileus × 660.

Pileus hemispherical, becoming conico-campanulate and expanding to about 5 cm., surface vinaceous-buff, almost concealed by crowded, minute, russet to Mars brown squamules ; flesh pale yellowish, at once staining xanthine orange on exposure to the air ; gills crowded, broad, free, ivory yellow, the edge staining like the flesh ; stipe attenuated upwards from about 5–7 to 2–4 mm. concolorous with the pileus and scurfy-squamulose like it below the ring, solid ; ring large, membranous, sheathing the stipe, white above, concolorous with the pileus and squamulose below. Spores broadly elliptical, red-amyloid, 7–9 × 5–6μ, cheilocystidia thin-walled, balloon-like, 40–55 × 12–20μ, some with narrow cylindrical beaks about 12 × 3μ, contents granular ; pileus

surface covered with erect, ventricose, obtuse hairs up to 210 × 15μ, dark red-brown at the base, shading to hyaline at the tip, forming a pile which cracks into squamules. Fig. 21. Subcaespitose on logs.

Collections seen : Trinidad : Botanic Garden, Port of Spain, 11.XI. 1949, *Dennis* 326. This closely matches the typus from Ceylon.

Lepiota *cf.* **zamurensis** *Pat. et Gaill.* in Bull. Soc. Myc. France 4, 10 (1888).

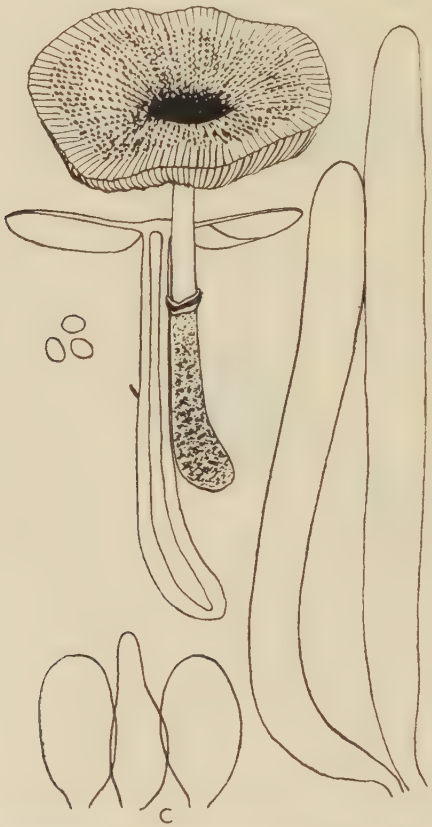

Fig. 22. *Lepiota* cf. *zamurensis*. Spores, cheilocystidia (C) and hairs of the pileus × 660.

Pileus convex, becoming flattened, up to 5 cm. diameter, plicato-striate to the disc, white, dark vinaceous drab at the disc and dotted elsewhere with minute squamules of that colour ; flesh thin, soft, white in the pileus, brown at the disc and in the stipe ; gills of two lengths, crowded, 4–5 mm. wide, white, free ; stipe slightly attenuated upwards to 3–4 mm. from a swollen base 6–8 mm. thick, avellaneous or darker, dotted below the ring with minute squamules like those of the pileus, hollow ; ring superior, fixed, collar-like, whitish with a vinaceous-drab margin. Spores elliptical, red-amyloid, 4–5 × 2·75–3μ, cheilocystidia balloon shaped, about 30 × 13–17μ, a few with a short, obtuse beak 3μ wide ; squamules of pileus and stem alike formed of erect, cylindric-fusiform, thinwalled, obtuse hairs 150–220 × 10–11μ, walls reddish-brown under

the microscope, turning dark gray-blue in potash solution. Solitary on the ground in forests.

Collections seen : Trinidad : Arena forest 30.X.1949, *Dennis* 251 ; Siparia Forest Bungalow 5.XI.1949, *Dennis* 251 A. Fig. 22.

Lepiota bakeri *Dennis* spec. nov.

Pileus 7 cm. latus, convexus, roseo-bubalinus, margine striatus, umbone humili " Verona "-brunneo, squamulis innatis, minutis, brunneis ; caro subcrassa, alba ; lamellae confertae, 5–6 mm. latae, albae, liberae ; stipes bulbosus, apice attenuatus, roseo-bubalinus, infra annulum tomentoso-squamulosus ; annulus superus, firmus, membranaceus, pendulus, albus, margine brunneus ; sporae ellipticae 5–7 × 3·5–4μ, pseudoamyloideae ; cheilocystidiae clavatae, hyalinae, 25–30 × 11μ. Ad terram conseminalis, St. Augustine, Trinidad, *Dennis* 248B, Typus. Fig. 23.

I suspect this was the fungus which Fries (1851) published as *L. excoriata* from Oersted's drawing No. 26, Naranjo, Costa Rica.

Fig. 23. *Lepiota bakeri*. Spores, cheilocystidium (C) and hairs of the pileus × 660.

Lepiota citriodora *Dennis* spec. nov.

Pileus 3 cm. latus, campanulatus, velutino-squamulosus, pulveris-sternutatorii brunneus ; caro tenuis, alba ; lamellae confertae, 2–3 mm. latae, liberae, albae dein brunneae ; stipes cylindricus, glaber, albus, dein deorsum pallide brunneus, fistulosus ; annulus superus, firmus, membranaceus, albus, margine brunneus ; sporae ellipticae, luteolae, guttulatae, 4–5 × 3–4μ pseudoamyloideae ; cheilocystidiae ventricosae

25 × 7μ. Odore suavis, Citrus limonum in mentem revocat. Ad terram, St. Augustine, Trinidad, *Dennis* 419, Typus. Fig. 24.

I have been tempted to identify this with *L. hemichlora* (Berk. et Br.) Sacc. from Ceylon, which has spores 4–5 × 2·5–3μ. Petch finds this to be a synonym of *L. flavido-rufa* (Berk. et Br.) Sacc. which he describes as having darker spores, the stipe mealy with yellow granules and the flesh turning red when cut. He mentions no distinctive odour.

Fig. 24. *Leiota citriodora*. Spore, cheilocystidium (C) and hairs of the pileus × 660.

Fig. 25. *Lepiota erinana*. Sporophore × 2, spore, cheilocystidia (C) and hairs of the pileus × 660.

Lepiota erinana *Dennis* spec. nov.

Pileus 1 cm. latus, conicus, expansus, " Mikado "-brunneus, velutina-squamulosus ; caro tenuis, alba ; lamellae confertae, arcuatae, liberae, roseo-bubalinae ; stipes cylindricus, undulatus, 1 mm. crassus, pileo concolores, floccoso-squamulosus ; annulus superus, evanescens ; sporae ellipticae 4–5 × 2μ, pseudoamyloideae ; cheilocystidiae 20 × 8μ. Ad lignum putridum, Erin, Trinidad, *Dennis* 301, Typus. Fig. 25.

Lepiota citrophylla (*Berk. et Br.*) *Sacc.*, Syll. Fung. **5,** 57 (1887).

Agaricus citrophyllus Berk. et Br. in Journ. Linn. Soc. Bot. **11,** 509 (1871).

Pileus about 1·25 cm. diameter, campanulate, naphthalene yellow, with minute scurfy, light brownish-olive squamules, continuous on the umbo, scattered elsewhere ; flesh thin, cream-buff in the pileus, isabella colour in the stipe ; gills crowded, coloured buff to naphthalene yellow, 1–1·5 mm. wide ; stipe slightly attenuated upwards, isabella colour, slightly furfuraceous below the ring ; ring fibrous, evanescent, superior. Spores elliptic-cylindric with a truncate base, 5–7 × 2·5–3·5μ, red-brown in Melzer's reagent, cheilocystidia more or less cylindrical, 25–30 × 6μ ; squamules formed of erect cylindrical cells 80 × 10μ, with rounded apices and brown granular contents. On soil in thickets. Fig. 26.

Collections seen : Trinidad, Erin, 6.XI.1949, on sandy soil under *Bactris* and *Heliconia*, *Dennis* 300.

L. citrophylla was described from Ceylon as a polymorphic species. Material of form (a) in Berkeley's herbarium yields spores like those of Dennis 300.

Fig. 26. *Lepiota citrophylla*. Cheilocystidium (C), spores and hairs of the pileus × 660.

Fig. 27. *Lepiota erythrosticta*. Spore, cheilocystidium (C) and hairs of the pileus × 660.

Lepiota erythrosticta (*Berk. et Br.*) *Sacc.*, Syll. Fung. **5,** 62 (1887).

Agaricus erythrostictus Berk. et Br. Journ. Linn. Soc. Bot. XI p. 508, 1871.

Pileus conic-campanulate, expanding to about 2·5 cm., vinaceous pink but closely dotted with minute, dark-vinaceous squamules, flesh thin ; almost white under the cuticle, brown in the stipe ; gills crowded, of two lengths, about 2·5 mm. broad, free, ivory yellow ; stipe equal, undulating, concolorous with the pileus, scurfy-squamulose below the superior evanescent ring, 2–2·5 mm. thick, hollow, arising from a white mycelium. Spores cylindrical, very slightly heeled at the proximal end, narrowed and rounded at the distal end, 5–6 × 3μ, red amyloid ;

cheilocystidia slightly ventricose, hyaline, thinwalled, about 35 × 7μ, squamules formed of erect, inflated, obtuse, thinwalled hairs, mostly one-celled, 20–100 × 12–14μ. Solitary on rotting logs. Fig. 27.

Collections seen : Trinidad : L'Orange, Aripo valley, 13.X.1949, *Dennis* 171. The type, from Ceylon, has similarly shaped spores which range a little larger, 5–6–8 × 3–4μ.

2 F. *Spores non-amyloid, only yellowish in Melzer's reagent.*

**Pileus mealy, white.*

Lepiota pseudogranulosa (*Berk. et Br.*) *Sacc.*, Syll. Fung. **5,** 53 (1887). *Agaricus pseudogranulosus* Berk. et Br. in Journ. Linn. Soc. Bot. **11,** 501 (1871).

Pileus 1–2 cm. diameter, fusiform, then conico-campanulate, covered with white meal, becoming tinged vinaceous-buff at the umbo ; flesh thin, white, avellaneous in the stipe ; gills subdistant, of two lengths, broad, rounded behind, white ; stipe equal, 1–2 mm. thick, hollow, avellaneous, finely mealy below the ring ; ring superior, white, mealy beneath. Spores elliptic-cylindric, non-amyloid, 3–5 × 2–2·5μ ; cheilocystidia cylindrical, thinwalled, about 40 × 7μ ; meal on the pileus composed of loose, thinwalled, hyaline cells, varying from subglobose about 20 × 15μ to cylindrical 30–45 × 8–10μ or even forked, arising from the tips of loosely tangled hyphae 8–12μ wide. Fig. 28. On soil or rotting logs in forests.

Fig. 28. *Lepiota pseudogranulosa.* Dennis 354, spores, cheilocystidium (C) and cells of the mealy coating of the pileus × 660.

Fig. 29. *Lepiota armillarioides.* Spore and cheilocystidium × 660.

Collections seen : Venezuela : El Junquito, 16.XI.1949, *Dennis* 354 ; Trinidad : Arena Forest, 1.XII.1949, *Dennis* 354 A.

Petch reduced *L. pseudogranulosa* to synonymy under *L. oncopoda* (Berk. et Br.) Sacc. because the specimen of the former retained in Ceylon had spores 13 × 8μ. But the type specimen of *L. pseudogranulosa*, Thwaites 823 in Herb. Berkeley has spores 3–5 × 2–2·5μ, which are certainly not those of *Sterigmatocystis nigra* as suggested by Petch.

***Pileus innately squamulose or fibrillose.*

Lepiota armillarioides *Dennis*, spec. nov.

Pileus 2·5 cm. latus, hemisphaericus dein expansus, pallide brunneus dein albidus, unbone cinnamomeo. squamulis minutis, concentricis,

adpressis, cinnamomeis ; caro tenuis, alba, firma ; lamellae confertae, exiguae, adnatae, albae ; stipes subcylindricus, 2 mm. crassus, fistulosus, albus, deorsum avellaneo-squamulosis ; annulus superus, exiguus, firmus ; sporae ellipticae, examyloideae, 5 × 3μ ; cheilocystidiae ventricosae, 30 × 8μ, apice 4μ crassus. Caespitosus ad ramenta putrida, Sangre Grande, Trinidad, *Dennis* 159, Typus. Fig. 29.

Lepiota subcristata *Murrill* in Mycologia **3,** 83, 1911 (non Beeli 1932).

Pileus less than 1 cm. diameter, conico-campanulate, with a vinaceous-brown umbo and dotted with minute, angular, adpressed vinaceous-brown squamules, margin striate ; flesh very thin, white ; gills crowded, white, arcuate ; stipe equal, up to 1 mm. thick, white, tinged with vinaceous-brown below the ring, smooth, hollow ; ring persistent, funnel-shaped, becoming moveable, white, vinaceous-brown at the edge beneath, fringed, superior. Spores elliptic-cylindric, non-amyloid, 5–6 × 2·5–3·5μ ; cheilocystidia balloon-shaped or broadly ventricose, hyaline, up to 20 × 12μ, giving the gills a denticulate appearance when dried ; squamules of the pileus formed of erect, pallisade-like, clavate cells filled with purplish-brown sap. Fig. 30. In small clusters arising from white mycelium on rotting wood.

Fig. 30. *Lepiota subcristata.* Dennis 291, sporophore × 2, cheilocystidia and spores × 660.

Collections seen : Trinidad : Quinam, 4.XI.1949, *Dennis* 291 ; Jamaica : Moore Town, 16.XII.1908, *W. A. and E. L. Murrill* 158 (Typus).

Lepiota ochraceo-aurantiaca *Dennis*, spec. nov.

Pileus 5 cm. latus, conicus, umbone plano, fibrillosus, ochraceo-aurantiacus ; caro alba, tenuis ; lamellae confertae, pallide bubalinae, liberae, 6 mm. latae ; stipes cylindricus, 6 mm. crassus, fistulosus, pallide bubalinus deorsum aurantiacus, fibrillosus ; annulus superus, latus, membranaceus, albidus, margine ochraceo-aurantiacus ; sporae ovoideae, guttulatae, examyloideae, 8–9 × 4–6μ ; cheilocystidiae hyalinae, fusiformes vel ventricosae, 40 × 11μ. Ad terram graminosam, Queen's Park Savanna, Trinidad, *Dennis* 372, Typus.

Lepiota erythrogramma (Berk. et Br.) Sacc. and *L. carpophylla* (Berk. et Br.) Sacc. are superficially similar but both have smaller red-amyloid spores.

L. ochraceo-aurantiaca may also be compared with the polymorphic *L. erythrella* Speg. which, however, has its cystidia encrusted with granules and mainly smaller spores 6–8 × 3·5–5μ.

****Pileus covered with brown granules.*

Lepiota sipariana *Dennis*, spec. nov.

Pileus 4 cm. latus, convexus, granulosus, brunneus ; caro tenuis, alba ; lamellae confertae, sinuato-adnatae, exiguae, pallide bubalinae ; stipes apice subincrassatus, solidus, eburneus, deorsum brunneo-granulosus ; sporae ellipticae, 4 × 2μ, examyloideae ; cheilocystidiae rarae, cylindricae, 3μ latae. Ad lignum, Siparia, Trinidad. *Dennis* 287, Typus. Fig. 31.

Fig. 31. *Lepiota sipariana.* Spores × 660.

Rhodopaxillus *R. Maire* in Ann. Mycol. **11,** 338 (1913).

Type species : *Ag. panaeolus* Fr.

Rhodopaxillus subisabellinus (*Murr.*) *Dennis*, comb. nov.

Melanoleuca subisabellina Murr. in Mycologia **3,** 194 (1911).

Tricholoma subisabellinum (Murr.) in Mycologia **4,** 332 (1912).

Pileus up to 7 cm. diameter, convex, then expanded and finally depressed with undulating margin, smooth, dry, clay colour to pinkish-buff ; flesh white, firm ; gills broad, crowded, of four lengths, adnate, vinaceous-buff ; stipe white, equal, fibrillose, solid. Spores elliptic-cylindric, finely punctate, 5–6 × 3·5μ, pale yellowish, pink in the mass, non-amyloid ; gill edge fertile, no cystidia ; basidia 4-spored, 9μ wide ; pileus surface of matted hyphae 5μ wide. Sporophores subcaespitose, terrestrial.

Collections seen : Trinidad : under coffee hedge, St. Augustine, *Dennis* 105, I.X.1949 ; Jamaica : Castleton Gardens, 14.XII.1908, *W. A. and E. L. Murrill* 45 (Typus).

I find the spores of the type collection of *R. broadwayi* (Murr.) Singer to measure 5·5–6·5 × 3·5–4μ, and suspect it may be the same species. Murrill, however, described *Clitocybe broadwayi* as having white gills and reddish-brown stipe. He did not see the fungus in the fresh condition and there are no collector's notes now with the type sheet at New York.

Hence until many more collections of *Rhodopaxillus* have been made in the West Indies by careful students of agarics it is probably unwise to assume the identity of *R. broadwayi* and *R. subisabellinus*.

Rhodopaxillus munduliformis *Dennis*, spec. nov.

Pileus 1·5 cm. latus, umbilicatus, fuscus, sordide innato-squamulosus ; caro tenuis, alba, firma ; lamellae confertissimae, exiguae, adnato-decurrentes, roseo-bubalinae ; stipes cylindricus, basi expansus, glaber, nitidus, solidus, pallide fuscus ; sporae ellipticae, verruculosae, 4–5 × 3–5μ, examyloideae ; cystidiae nullae. Ad lignum, Sangre Grande, Trinidad, *Dennis* 165, Typus.

The species recalls a small specimen of *R. mundulus* (Lasch) Konr. et Maubl. but differs from this and other members of the genus in its lignicolous habit.

Leucopaxillus *Boursier* in Bull. Soc. Myc. France **41,** 391 (1925).

Type species : *Clitocybe paradoxa* Cost. et Duf.

Leucopaxillus gracillimus *Singer et A. Smith* in Pap. Mich. Acad. Sci. **27,** 131 (1943).

Pileus up to 9 cm. across, convex, becoming slightly depressed with an undulating margin, blood-red, smooth, dry ; flesh thin, white, cheesy, taste rather sweet, smell mealy ; gills very crowded, of several lengths, comparatively narrow, decurrent, white, drying pale buff ; stipe equal, solid, white, smooth, arising from a white mycelium. Spores elliptical, finely punctate, 3–4 × 2·5–3μ, print white, strongly blue-amyloid, basidia 4-spored, 5–6μ wide, gill edge sterile but without distinctive cheilocystidia, no pleurocystidia ; hyphae of the pileus surface interwoven, thin-walled, about 3μ wide, tramal hyphae similar, yellowish-brown in Melzer's reagent.

Collection seen : Trinidad : on the ground in plantation, St. Augustine, 3.XII.1949, *Dennis* 157 A.

Clitocybe *(Fr.) Staude*, Die Schwämme Mitteldeutschlands, 1857.

Type species : *Agaricus nebularis* Batsch. ex Fr.

Clitocybe jamaicensis (*Murr.*) *Dennis*, comb. nov.

Melanoleuca jamaicensis Murr. in Mycologia **3,** 194 (1911).

Tricholoma jamaicensis (Murr.) Murr. in Mycologia **4,** 332 (1912).

Pileus umbilicate, 3·5 cm. diameter, surface somewhat fibrillose, vinaceous-tawny ; flesh thin, pale pinkish-buff, tasteless ; gills subdistant, broad, thick, adnato-decurrent, of three lengths, slightly veined at the base in age, light vinaceous-cinnamon with a bloom from the spores ; stipe slightly enlarged upwards, smooth, solid, light vinaceous-cinnamon.

Spores globose, smooth, non-amyloid, 4–5× 4μ, basidia 4-spored, 33–45 × 5–6μ, gill edge fertile, no cystidia ; pileus surface formed of parallel hyphae 4–5μ broad, trama of similar closely woven hyphae, subhymenium thick, loosely woven. Solitary, terrestrial.

Collections seen : Trinidad : bamboo plantation, St. Joseph, 20.IX. 1949, *Dennis* 7 ; Jamaica : under tree ferns, Morce's Gap, Blue Mts., 29.XII.1908–2.I.1909, *W. A. and E. L. Murrill* 720 (Typus).

Murrill's note on his fresh collections reads " Clit. or Trich. as I like, appear. of fresh plant sugg. Clitocybe proxima Boud." i.e. *Laccaria proxima* Boud. The resemblance to *Laccaria* also occurred to me when collecting my No. 7 and I would transfer the species to that genus were it not for the smooth spores. A curious feature of the Trinidad material is that the tramal hyphae are encrusted with minute granules which dissolve in Melzer's reagent with copious evolution of gas. This reaction is not obtained if the gills have been soaked previously in KOH solution.

Clitocybe microspora *Baker et Dale* in Comm. Myc. Inst. Myc. Pap. 33, 85 (1951).

Pileus up to 3·5 cm. diameter, convex, umbilicate, smooth, dry, cream colour or orange cinnamon shading to cinnamon buff or whitish at the margin and drying russet ; flesh thin, not hygrophanous, white, tasteless, smell mealy ; gills narrow, crowded, of three lengths, decurrent, white, drying buff ; stipe enlarged upwards, light pinkish-cinnamon, dry, solid. Spores elliptical, 2·5–3 × 1·5–2·5μ non-amyloid, basidia 4-spored, about 4μ wide, no cystidia, pileus surface of thinwalled hyphae 3μ wide. Terrestrial, solitary.

Collections seen : Trinidad : bamboo plantation, St. Joseph, 2.IX. 1947, Baker and Dale 1558 (Typus) ; in forest on crest of northern range north of Arima, 25.IX.1949, Dennis 60. This latter collection shows the fungus to be somewhat variable as the stipes vary from 32 × 3·5 mm. to 10 × 9 mm. The pileus is also browner than in Baker's sketch of his 1558 but I think it is the same species for the two have dried alike ; probably the colour varies considerably with age. From *C. ditopoda* (Fr.) Gill. and *C. murinifolia* Murr. *C. microspora* differs in colour and especially in its white gills. *C. subinversa* Murr. is said to have spores 3–4·5μ diameter and to be fulvous when dry. *C. brunnescens* Murr. with spores 3–3·5μ diameter has gills becoming dark fuliginous. For a figure of this species see Baker and Dale (1951, Plate II fig. C.).

Clitocybe bicolor (*Baker et Dale*) *Dennis*, comb. nov.

Omphalia bicolor Baker et Dale in Comm. Myc. Inst. Myc. Pap. 33, 91 (1951).

Pileus 2–3 cm. diameter, ferruginous, convex then depressed around a low umbo, dry, fibrillose ; flesh white under the cuticle ; gills subdistant, slightly decurrent, rounded behind, 2 mm. broad, white ; stipe equal, solid, white, smooth.

Spores subglobose, 4–5 × 3·5–4μ, non-amyloid.

Collection seen : Trinidad, on bamboo stools, St. Joseph, 9.VIII. 1947, *Baker et Dale* 1494 (Typus) ; same locality 20.IX.1949, *Dennis* 482. For a coloured figure see Baker & Dale (1951, Plate II fig. f.).

This beautiful little species bears considerable resemblance to *Leucopaxillus gracillimus* Singer & Smith but is easily distinguished by its larger,

smooth, non-amyloid spores. Its nomenclature presents some difficulties. In 1945 Murrill published an *Omphalina bicolor* and in the same paper printed the alternative combination *Omphalia bicolor*. But alternative names are not validly published (see Article 37 of the Rules of Nomenclature) so that *O. bicolor* Baker et Dale is not invalidated as a later homonym. Unfortunately *Omphalina* Quél. is the valid name for the genus commonly called *Omphalia* (Fr.) Quél. and if the plant is retained in the genus selected by its authors the name must be changed to *Omphalina* and a new specific epithet provided. Because of the solid stipe, however, it is probably better to transfer it to *Clitocybe* as proposed above.

Hygrophoropsis (*Schroeter*) *R. Maire apud Martin-Sans* L'Empoisonnement, 99 (1921).

Type species : *Cantharellus aurantiacus* (Wulf ex Pers.) Fr.

Hygrophoropsis purpurascens (*Berk. et Curt.*) *Dennis*, comb. nov.

Marasmius purpurascens Berk. et Curt. in Journ. Linn. Soc. Bot. **10,** 296 (1869).

Lentinus subscyphoides Murr. in Mycologia **3,** 34 (1911).

Pileus up to 5 cm. diameter, infundibuliform, splitting into segments, heliotrope gray, soon fading to drab or avellaneous, smooth, dry ; flesh thin, rather tough, vinaceous lavender ; gills crowded, of several lengths, decurrent, sometimes forked, very narrow, vinaceous lavender fading to drab ; stipe equal, hollow, minutely tomentose, concolorous with the pileus, arising from a white mycelium.

Spores elliptical, 3 × 2μ, white in the mass, non-amyloid, basidia 4-spored, 15 × 3μ, gill edge fertile, no cystidia ; trama composed throughout of thin-walled tightly woven hyphae 3μ wide, no specialised cuticle to the pileus. On logs in forests. Fig. 32.

Fig. 32. *Hygrophoropsis purpurascens.* Dennis 92, spores and basidium × 660.

Collections seen : Trinidad : River Estate, Diego Martin, 29.IX.1949, *Dennis* 92 ; Quinam, 4.XI.1949, *Dennis* 92 A ; Venezuela : Rancho Grande, Maracay, 19.XI.1949, *Dennis* 92 B ; Jamaica : Moore Town, 16.XII.1908, *W. A. & E. L. Murrill* 155 (Typus of *L. subscyphoides*) ; Cuba : *Wright* 44, October (Typus).

This is evidently a common fungus in the West Indies for Murrill recorded *L. subscyphoides* also from Martinique, Porto Rico and British Honduras. Montagne's figure of *Cantharellus buccinalis* Mont. looks rather similar but the type at Paris seems different from *H. purpurascens*.

Agaricus (**Collybia**) **synodicus** *Kunze apud Fries* in Linnaea **5,** 507 (1830).

Marasmius synodicus (Kunze) Fr. in Epicrisis p. 381 (1838).

Marasmius nivosus Berk. in Hooker's Journal of Botany **8,** 139 (1856).

Pileus hemispherical, then flattened, up to 1 cm. diameter, pale-vinaceous-drab, fading to cream-buff and drying white, surface minutely tomentose ; flesh thick at the disc, thin at the margin, white in the pileus, buff in the stipe, tough ; gills narrow, distant, decurrent, somewhat wedge-shaped, sometimes once forked ; stipe cylindrical, concolorous, minutely pruinose, about 1·5 mm. thick. Spores hyaline, somewhat tear-shaped, 5–6 × 2·5–3μ, print white, non-amyloid, basidia about 15 × 4–5μ, gill edge fertile, no cystidia, tramal hyphae somewhat loosely woven, hyaline, 4–5μ wide with moderately thick walls, pileus surface of similar matted hyphae. Gregarious on dead sticks.

Collections seen :—Trinidad : Cerro del Aripo, c. 1500′, 23.X.1949, *Dennis* 230 ; Surinam : leg *Weigelt* 1827, isotypus in Herb. Uppsala ; Brazil : Mt. Cocui, *Spruce*, in Herb. Hooker, typus of *M. nivosus*.

Fig. 33. Isotype of *Marasmius synodicus* at Uppsala. Sporophore × 6, section of gills × 20, spores and basidium × 660.

Thwaites 932, Peradeniya, Ceylon, Dec. 1868, referred to this species by Berkeley is probably distinct as are certainly Petch's collections under the name *M. nivosus*. The type of *M. synodicus*, kindly lent me by Prof. Nannfeldt, is in excellent condition, free from moulds and with recognisable spores. Fig. 33. The systematic position of this curious little species is still not clear to me. It is neither a *Marasmius* nor a *Collybia*. I have placed it next to *Hygrophoropsis purpurascens* because of its thick, narrow, decurrent gills with a tendency to fork, its mauve juvenile colouring and lignicolous habit. But the hyphae are broader and thicker walled than in that species and its real affinity may possibly be rather with *Panus torulosus* (Pers.) Fr. or even with *Lentinus*.

Omphalina *Quél.* Enchiridion fungorum 42 (1886).

Type species : *Agaricus umbelliferus* L. ex Fr.

Key to the species in Trinidad :

I. Pileus with a hymeniform cuticle, glaucous . . . . *O. viridifusca*

II. Pileus surface of more or less parallel radiating hyphae :

A. Spores narrowly cylindrical, 7–8 × 3μ . . *O. cylindrospora*

B. Spores elliptical :

a. Dried pileus turning red and yielding a red stain in KOH solution . . . . . *O. cyathiformis*

b. No such colour change :

* Spores 4·5–5·5 × 3–4μ, pileus gray-brown *O. cf. jalapensis*

**Spores larger :

†Sporophore dingy yellow to brown . . . *O. euomphalus*

†† Sporophore bright yellow . . *O. euomphalus* var. *lutea*

††† Sporophore white, drying yellow, very small, gills fold-like *Omphalia flavella*

Omphalina viridifusca (*Berk. et Curt.*) *Dennis*, comb. nov.

Marasmius viridifuscus Berk. et Curt. in J. Linn. Soc. Bot. **10,** 295 (1869).

Fig. 34. *Omphalina viridifusca.* Dennis 274, section of pileus cuticle, spore and basidium × 660.

Pileus convex, umbilicate, smooth, dry, deep olive, almost black at the margin and along the striae ; flesh thin, cream under the cuticle in the pileus, avellaneous in the stipe ; gills adnato-decurrent, subdistant, of three lengths, rather narrow, cream coloured, slightly interveined especially when dried ; stipe slender, equal, hollow, avellaneous with a whitish bloom. Spores elliptical, non-amyloid, 4–4·5 × 3μ, basidia 25 × 4–5μ, fourspored, tramal hyphae thin-walled, 3–4μ wide, non gelatinised, non-amyloid, pileus surface a pallisade of thin-walled elliptical cells 20–25 × 10μ, with gray-brown sap. Fig. 34. On dead sticks and rotten wood in forests.

Collections seen : Cuba : Wright 41 (Typus) ; Trinidad : Siparia 3.XI.1949, *Dennis* 274.

Omphalina cylindrospora *Dennis*, spec. nov.

Pileus 4 cm. latus, profunde umbilicatus, striatus, isabellinus, in sicco fuscus ; caro tenuis, cremea ; lamellae subdistantes, latae, tenuis, venosae, cremeae, decurrentes ; stipes bubalinus, glaber, fistulosus, apice subincrassatus ; sporae cylindricae vel suballantoideae, 7–8 × 3μ, examyloideae ; basidia tetraspora, 25 × 6–7μ ; cystidiae nullae. Ad terram (? ad lignum putridum) in silvis, Naranja, Trinidad, *Dennis* 112, Typus. Fig. 35.

The description of *Omphalia spodoides* (Mont.) Sacc. reads much like this species but an authentic specimen at Kew has slender tramal hyphae. *Clitocybe vespertilio* (Berk.) Sacc. has a gelatinous pellicle. *Heliomyces sprucei* Berk. is structurally similar to *O. cylindrospora* but has much more distant gills and a purplish-brown, scarcely umbilicate pileus with white striae. *Omphalia earlei* Murr. is not umbilicate and has very narrow gills. *Clitocybe mexicana* Murr. has similar spores but is a much stouter caespitose fungus.

Fig. 35. *Omphalina cylindrospora.* Spore × 660.

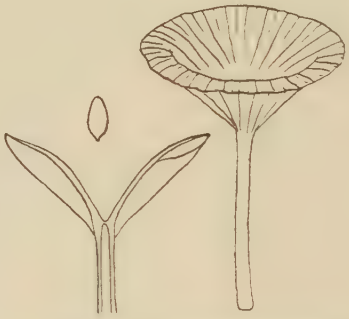

Fig. 36. *Omphalina cyathiformis.* Dennis 307, spore × 660.

Omphalina cyathiformis (*Berk. et Curt.*) *Dennis*, comb. nov.

Marasmius cyathiformis Berk. et Curt. in J. Linn. Soc. Bot. **10,** 295 (1869).

Pileus 2–3 cm. diameter, deeply umbilicate, smooth, dry, clay colour with darker striae ; flesh thin, concolorous in the pileus, yellow in the upper part of the stipe, soft ; gills broad, attenuated at each end, of two to three lengths, subdistant, decurrent, honey-yellow, drying orange-cinnamon ; stipe equal, tubular, ochraceous-buff above, shading to fuscous at the base. Spores oval, 6–8 × 3–4μ print white, non-amyloid, basidia four-spored, 25 × 5–6μ, no cystidia, trama of thin-walled hyphae 8–10μ wide, non-gelatinised, red after treatment in KOH and yielding a red stain, pileus surface of more or less parallel, radiating, woven hyphae, 8–10μ wide ; upper part of the stipe pruinose with delicate hyaline to yellowish, cylindrical, unicellular hairs about 80 × 7μ. The dried pileus turns dark red on treatment with KOH. On dead wood.

Collections seen : Cuba : *Wright* 84 (Typus) ; Trinidad : Erin, 6.XI.1949, *Dennis* 307.

Omphalina cf. jalapensis *Murrill* in N. American Flora **11,** 349 (1916).

Pileus 1·5 cm. diameter, infundibuliform, buffy brown, smooth ; flesh thin, tough, white ; gills very narrow, crowded, of two lengths, decurrent, white, drying buff ; stipe slender, slightly tapering at the base, smooth, hollow, white tinged brown at the base. Spores elliptical, 4·5–5·5 × 3–4μ, non-amyloid, basidia 20 × 5μ, no cystidia, trama of thin-walled but firm hyphae, 4μ wide, yellowish-brown in Melzer's reagent, pileus surface of similar woven hyphae. On the ground amongst leaves.

Collection seen : Trinidad : *Theobroma* plantation, River Estate, Diego Martin, 22.IX.1949, *Dennis* 28.

The type of *O. jalapensis* was on the ground in humus in moist forest near Jalapa, Mexico. It was considerably larger, up to 3·5 cm. broad, and whitish. Structurally and in its basidia and spores, however, it is like Dennis 28. As only a single sporophore of the latter was collected one cannot estimate the significance of the difference in size and colour.

Omphalina euomphalos (*Berk.*) *Dennis* comb. nov.

Agaricus euomphalos Berk. in Hooker's Journal of Botany **8,** 131 (1856).

Omphalia euomphalos (Berk.) Sacc., Syll. Fung. **5,** 334 (1887).

Pileus up to 3 cm. diameter, convex, umbilicate, sometimes with a minute umbo at the bottom of the umbilicus, olive-buff to buffy-brown, marked with darker radiating fibrils, smooth, dry ; flesh thin, soft, cream to pale buff ; gills subdistant, decurrent, of two to three-lengths, rather narrow, somewhat connected by veins, cream to tilleul buff ; stipe equal or slightly enlarged upwards, smooth, hollow, concolorous with the pileus. Spores broadly elliptical, 5·5–8 × 3·5–4μ, non-amyloid, basidia fourspored, 5–6μ wide, no cystidia, tramal hyphae 3–5μ wide, thinwalled, hyaline, interwoven, not gelatinised, light brown in Melzer's reagent, pileus surface of parallel thin-walled similar hyphae with dark brown sap. Gregarious on the ground in plantations. Fig. 37.

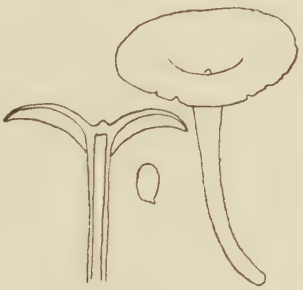

Fig. 37. *Omphalina euomphalos.* Dennis 80a, spore × 660.

Collections seen : Brazil : Panuré, *Spruce* 133 (March 1853) and *Spruce* 122 (Feb. 1853), Typus ; Trinidad : under bamboo, St. Joseph, 27.XI.1949, *Dennis* 80 ; 18.X.1949 *Dennis* 80A, 80B ; under *Ficus benjamina*, Botanic Garden, Port of Spain 25.XI.1949, *Dennis* 307A. Judging by the description *O. subcartilaginea* Murr. from New Orleans is similar.

Omphalina euomphalus (*Berk.*) *Dennis* var. **lutea** Dennis, var. nov.

A typo differt pileo luteo, sporae 7–9 × 5–7μ.

Ad lignum, Port of Spain, Trinidad, *Dennis* 323, Typus. Fig. 38.

Because of the broader spores and lignicolous habit this may be worth specific rank. It is tempting to identify it with *Omphalia flavella* (Berk. et Curt.) Sacc. but that was described as " pileo convexo . . . stipite capillari . . . puberulo ". All sporophores have been lost from the type at Kew but the stipe bases which remain suggest a much smaller fungus of the stature of *Mycena citricolor*. It is more likely to be represented by the following collection :

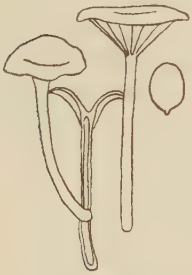

Fig. 38. *Omphalina euomphalos* var. *lutea*. Spore × 660.

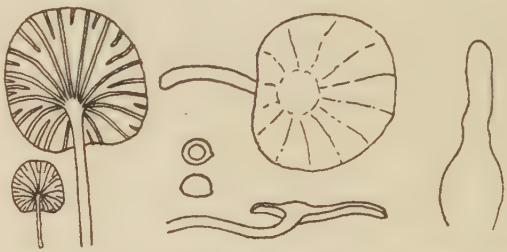

Fig. 39. ?*Omphalia flavella*. Sporophores and radial section × 3 (Naturalsize below), spores and cheilocystidium × 660.

?**Omphalia flavella** (*Berk. & Curt.*) *Sacc.*, Syll. Fung. **5,** 334 (1887).

?*Agaricus flavellus* Berk. et Curt. in J. Linn. Soc. Bot. **10,** 286 (1869).

Pileus 5–7 mm., convex, orbicular to reniform, smooth, pellucidly striate, white, drying deep yellow ; flesh thin, white, soft and translucent ; gills very narrow, parallel sided, thin, decurrent, of two or three lengths, neither forked nor interveined ; stipe equal, curved, ½ mm. thick, white, minutely downy with delicate, ventricose or clavate, hyaline hairs 20–30 × 8–9μ. Spores broadly elliptical, 5·5–6 × 4·5–5μ, non-amyloid, basidia twospored, cheilocystidia delicate, bottle-shaped 12–17μ wide at the base or like the hairs of the stipe ; tramal hyphae short-celled, reddish-brown in Melzer's reagent, pileus surface of similar thin-walled hyphae 17–20μ wide. In swarms on dead palm roots. Fig. 39.

Trinidad : Botanic Garden, Port of Spain 11.XI.1949, *Dennis* 320.

This beautiful little fungus in many ways recalls *Omphalia clavata* Peck, on *Thuja* trunks in New York State, which, however, has distant gills and fourspored basidia. The collector's note on the sheet of *O. flavella* at Kew reads : " No. 141, Sulphur yellow. Cap arched, thin, smooth, striate. Stipe slender, dilated above, puberulent, hollow? Gills few, remote, unequal, decurrent. On sticks in woods, Aug.". This could well apply to my 320 but in the absence of the type specimen I am unwilling to insist on the identification or to make the necessary recombination of the specific epithet.

Corrugaria *Metrod*, Les Mycenes de Madagascar p. 127, 1949.

Type species : *C. viridiflava* Metrod.

Corrugaria was founded by Metrod as a monotypic genus with sub-

globose spores 7–8·5 × 5·5–7μ on both two and fourspored basidia, with cystidia. The type species invites comparison both with the mysterious genus *Heliomyces* Lév. and with *Hiatula* Fr. The following Venezuelan collections are almost certainly congeneric with *C. viridiflava* but because of its blue-amyloid spores it is not unlikely future systematists may merge *Corrugaria* with *Mycena*.

Corrugaria alba *Dennis*, spec. nov.

Pileus 1·7 cm. latus, albus, expansus, depressus, in dorso lamellarum sulcatus ; caro tenuissima, alba ; lamellae exiguae, liberae, aequales, minute venosae ; stipes cylindricus, tenuis, fistulosus, albus, minute fibrillosus ; sporae globosae, amyloideae, apiculatae, guttulatae, 6–7μ latae ; basidia bispora, 22 × 6–7μ ; cystidiae nullae. Solitarius ad terram in silvis, Rio Chacaito, Venezuela, *Dennis* 398, Typus. Fig. 40.

Örsted's figure of *Marasmius glebigenus* Fr. from the Danish West Indies is very like *C. alba* but shows a yellow spot at the disc and the stipe was " fusco-nigro " so that it probably was a true *Marasmius*.

Fig. 40. *Corrugaria alba.* Spores and basidium × 660.

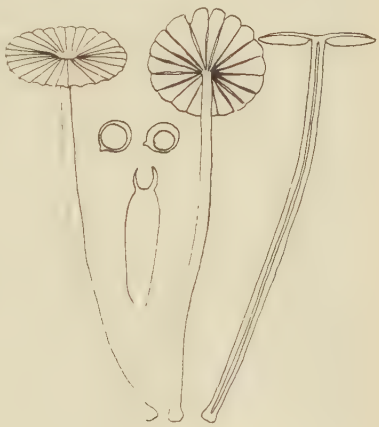

Fig. 41. *Corrugaria radiata.* Spores × 660.

Corrugaria radiata *Dennis*, spec. nov.

Pileus cylindricus, conicus, dein expansus, 4 cm. latus, argillaceus vel brunneus, minute squamulosus, in dorso lamellarum striatus dein sulcatus; caro alba, tenuis ; lamellae subdistantes, liberae, tenues, latae, albae ; stipes cylindricus, 2–4 mm. crassus, basi incrassatus, fistulosus, pruinosus, albus ; sporae ellipticae, 6–9 × 3–3·5μ, biguttulatae, amyloideae ; cystidiae nullae. Ad truncos putridos, Rio Chacaito, Venezuela, *Dennis* 395, Typus. Fig. 41.

It may be questioned if this be not *Ag. benzonii* Fr., one of the original species of *Hiatula*. Fries own figure in Icones t. 79 fig. 2 shows a brown expanded pileus split along the backs of the gills to expose the white flesh, with a very shallow umbilicus. Gonnermann and Rabenhorst, t. 7 fig. 14 figured under the same name a much paler caespitose fungus, striate only at the margin, with slender stipe, villose at the base, and no umbilicus. The two figures look quite different yet Gonnerman & Rabenhorst, whose fungus was sent them by Oudemanns from an orchid house at

Amsterdam, say " El. Fries ihn als A. Benzonii bestimmt habe." It is from this specimen that the spore size, 7·2–8·3 × 8·0–11·0μ, copied by all subsequent authors, is derived. Spegazzini (1909) identified a S. American fungus with spores 10 × 6μ as *Ag. benzonii* Fr.

Hiatula subcaespitosa Speg. from southern Brazil has amyloid spores 6 × 3μ and narrow gills of two lengths.

Mycena *Pers. ex S. F. Gray.* Nat. Arrang. Brit. Plants **I,** 619 (1821).

The Mycenas of Trinidad were dealt with in Dennis (1951) but two additional species overlooked when that paper was written, may be described here :—

Mycena acicula (Fr.) *Quél.* var. **longispora** *Dennis* var. nov.

A typo differt sporis longioribus, lamellis aurantiacis. Ad lignum putridum, Aripo, Trinidad, Dennis 219, Typus.

Pileus 5 mm. diameter, convex, hygrophanous, smooth, flattened and minutely scurfy at the disc, orange chrome, fading to apricot-yellow between the gills ; gills subdistant, of two lengths, about ten reach the stipe, adnate with a tooth, salmon-orange ; stipe slender, equal, smooth, dry, lemon chrome ; flesh thin, light yellow. Spores narrowly elliptical, 11–14 × 3μ, non-amyloid, basidia fourspored about 20 × 7μ some appear twospored, no cystidia ; pileus surface of elliptical, thin-walled cells, 25–60 × 15–16μ, filled with yellow sap. Solitary on rotten wood.

Collection seen : Trinidad : Cerro del Aripo, 23.X.1949, *Dennis* 219 (Typus).

Differs from the type in its longer spores and orange gills. Typical *M. acicula* has cheilo and pleurocystidia scarcely distinguishable from the basidia and possibly similar bodies may have been overlooked in Dennis 219. This charming little fungus might be taken for a slender *Hygrophorus* but its habit, narrow spores and short basidia indicate affinity with *Mycena*. The description of *Omphalia succinea* Speg. " tota pulchre aurantio-succinea, subpellucida " on dead bamboo culms in Brazil recalls *M. acicula* but the type at La Plata seems to have much more slender hyphae. I was unable to recover its spores.

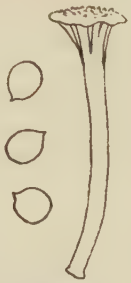

Fig. 42. *Mycena minima.* Spores × 660.

Mycena minima *Dennis*, spec. nov.

Pileus 3 mm. latus, planus, squamulosus, coccineus, margine luteolus ; caro lutea ; lamellae 7–8, inaequales, decurrentes, exiguae, cremeae ; stipes cylindricus, apice incrassatus, aurantiaco-coccineus, glaber, solidus ;

sporae subglobosae, 8 × 6μ, hyalinae, examyloideae ; basidia tetraspora, 30 × 10μ ; cystidiae nullae. Solitarius ad truncos bambusarum, St. Joseph, Trinidad, *Dennis* 186, Typus. Fig. 42.

This beautiful little species might be sought in *Hygrophorus*, in the vicinity of *H. cantharellus*. Its lignicolous habit and rather short basidia seem, however, to indicate its affinity with the Adonidae in *Mycena*. The pileus surface is composed of thin-walled hyphae, with cells about 40–60 × 14μ, filled with orange sap.

Literature cited.

Baker, R. E. D. & Dale, W.T. 1951. Commonwealth mycological Institute Mycol. Paper 33.

Dennis, R. W. G. 1951. Trans. Brit. mycol. Soc. 34, pp. 411–482.

Fries, E. 1851. Nova Acta Soc. Sci. Upsal. 1, pp. 17–231.

Gonnermann, W. & Rabenhorst 1882. Mycologia europaea Heft 9.

Locquin, M. 1945. Bull. Soc. Linn. Lyon 14.

Petch 1910. Ann. Roy. Bot. Gard. Peradeniya. 4, pp. 373–444.

Rick, J. 1907. Broteria, Ser. Bot. 6, pp. 65–91.

Singer, R. 1951. Lilloa 22.

Singer, R. 1952. Lilloa 23, pp. 147–246.

Spegazzini, C. 1899. An. Mus. Nac. Buenos Aires. 6, pp. 81–367.

Spegazzini, C. 1909. An. Mus. Nac. Buenos Aires. 19, pp. 257–458.

von Höhnel, F. 1908. Sitz. K. Akad. Wiss. Wien Math. Nat. Kl. 117, pp. 999–1007.

Acknowledgements

The indebtedness to Sir Edward Salisbury and to my friends in the West Indies and Venezuela expressed in Dennis (1951) applies equally to the present paper. In addition I am also deeply indebted to Dr. R. Singer of Tucuman for generously lending me his private notes on Murrill's type specimens of Florida Lepiotas now at Gainesville. Permission to borrow these types was refused by the authorities of that institution and without Dr. Singer's ready help I should have been unable to take Murrill's later species into consideration when attempting to name my Trinidad Lepiotas. I am grateful also to Dr. Gilbert for his comments on *Amanita antillana* and to the authorities of those institutions from which it has been possible to borrow types.

Pollen and Systematics.*—The study of pollen grains has become of increasing importance in recent years. It has long been recognized that in certain families (with *Acanthaceae* as a good example) pollen grain structure is of considerable taxonomic value, though for some purposes it has possibly been over-stressed. The knowledge that pollen grains and various other spores are almost indestructible by the agents of ordinary natural decay, and that consequently they occur in considerable quantities in post-glacial peat deposits and in older rocks of various kinds, emphasized the need for a systematic study of spore structure. This is being carried out in Sweden by Dr. G. Erdtman and his associates at the Palynological Laboratory in Stockholm. It has also become increasingly evident that pollen structure provides characters of value in the taxonomic studies of existing floras additional to the few families in which it has been considerably used in the past.

Dr. Erdtman has now provided us with a most useful account in compact form of the pollen grain morphology of the Angiosperm families. The sub-title is " An Introduction to Palynology I.", so one assumes that another volume (or other volumes) will appear in due course. In this volume the pollen grains of Angiosperms are considered under families arranged in one alphabetical sequence, after a short introduction which includes an outline account of pollen preparations and pollen and spore morphology in general.

The book is, in the main, one for reference. Concise descriptions of pollen grain structure for a given family and selected species are given. There are full bibliographical references and very clear black and white drawings for most of the families. Brief comparisons or contrasts are made with supposedly related families or to families having more or less similar pollen morphology. The glossary provided is essential to everyone who consults this work unless he be a modern palynologist familiar with the many new terms. There is a long bibliography and a detailed index to plant names.

Dr. Erdtman is to be congratulated on the appearance of this book. We look forward to the appearance of the next volume and especially to a general account of the value of pollen morphology in providing new criteria for assessing affinities. It would be very interesting to have a classification of the Angiosperms based on pollen structure. Such a classification would, of course, be a special not a general classification but it would provide, in an easily assimilable form, data for incorporation in a general classification.

W. B. Turrill.

*G. Erdtman, Pollen morphology and plant taxonomy, Almquist and Wiksell, Stockholm ; The Chronica Botanica Co., Waltham, Mass., U.S.A., pp. 539, fig. 261, 1952. 73 Swedish Kröner.

PUYA BERTERONIANA.

W. Balfour Gourlay.

Central Chile is a region of winter rain and a long dry summer season ; and the local plants have to accommodate themselves to these conditions. Visitors who have wandered about Valparaiso, the chief port, or Santiago, the capital—some sixty miles to the south-east and at an altitude of some 2000 feet—will have been struck by the abundance of Cacti and other prickly xerophilous plants. Among the most striking of these are two species of *Puya*, members of the *Bromeliaceae*, or Pineapple family. These are immense rock plants with scaly stems and rosettes of prickly leaves, from which arise great compound spikes of flowers to a height of eight to ten or more feet. Two species predominate in the region. Of these the commoner, *P. chilensis* (Syn. *P. coarctata*) (fig. 1) has greenish yellow flowers, and is known locally as " Cardón ". (Bot. Mag. t. 4715.) The less common one, of nearly the same size, has flowers of a remarkable metallic blue-green. Its vernacular name is " chagual " (pronounced cha-waal). Known in the past by a number of scientific names, these have now been discarded in favour of *Puya berteroniana* of Mez. (Fig. 2).

N.B. I have followed Federico Johow in using the popular name " cardón " for the one species *Puya chilensis* and " chagual " for no other than the species now to be called *Puya berteroniana*. But Señor Looser has now informed me that the names cardón, chagual and puya (which are Spanish, Quichua and Mapuche respectively) are often used indiscriminately for several different species. Cardón, in Spain, may be the teasel or thistle ; and in different parts of Spanish America is applied also to a variety of spinous plants. Quichua is the surviving language of the ancient Incas of Peru and Bolivia, while Mapuche is that of the Araucanian Indians of Central and South Chile.

In both the cardón and the chagual, in common with other members of the sub-genus *Puya*, the apical half or two thirds of the spikelets are clad only in sterile bracts, on which birds may often be seen perching, and for which they seem to be well adapted—so much so, in fact, that the adaptation may possibly be more than coincidental. Humming birds, which visit the flowers for the insects they contain and the nectar which is produced in great quantity, require no such foothold. But the little Chilean " tordo ", also a feeder on insects and nectar, may have had a longer association with the Chilean Puyas than any humming bird.

Frederick Johow,* writing in a Chilean periodical, says of it :—

" The pollination of *Puya chilensis* is effected by a bird which sucks the nectar, and to whose head the sticky golden pollen adheres. This bird is the well known " Tordo " (*Curaeus aterrimus* von Kittl. fam. *Icteridae*), a species somewhat resembling the European starling. To obtain the nectar, the bird perches on the sterile ends of one of the spikelets, sipping from the flowers at their bases . . . . And in Spring, in places where the plant abounds, it is difficult to find a tordo which does not show its otherwise completely black head adorned with a large splash of the most

*" Estudios de Biologia vegetal," por Federico Johow. Anales Universidad Chile 1910. p. 32, and quoted by G. W. Robinson. R.H.S. Journ. Vol. LXXV. Part 7. p. 282.

glorious yellow colour, but which is more golden where the chagual predominates." Johow mentions also that *Puya venusta* Phil.—a species without "bird perches"—is visited only by humming birds. Such observations would suggest that these "bird perches" may have been specially evolved for the mutual benefit of plant and bird.

And here it may be of interest to note that H. O. Wagner*, writing about humming birds, states "The family *Trochilidae* originated in Tropical S. America, perhaps late in the Cretaceous or early Tertiary—at any rate a period of exceptionally stable tropical climate . . . . This permitted an adaptation to a diet consisting largely of nectar, and not subject to shortage caused by the pronounced flowering seasons that characterize all temperate and even subtropical regins. The deterioration of the climate in the latter part of the Tertiary, and the development of pronounced seasons nearly everywhere, except in a small portion of the tropics, favoured a return to a greater utilization of insects. This was particularly true for species that had colonized subtropical and temperate zones, where nectar food was not available at all seasons. Such species either became migratory or adapted themselves to a seasonal diet of insects." From this one may conclude that, before the late Tertiary period, the little Chilean tordo had no Trochilidian rivals for Puyan nectar.

But in England Major Albert Pam (who was a pioneer in keeping humming birds in captivity, and has also so kept a Chilean tordo, finds that insect food, or some substitute, is essential for keeping humming birds alive ; while the tordo will thrive on a diet suitable for any insectivorous bird, without nectar or honey. In humming birds, with their long beaks and tongues, the head does not come in contact with the flowers. Major Pam considers that the sterile spikelets of some species of Puya were no more specially evolved [or designed] as bird perches than are our telegraph wires.

The name *Puya chilensis*, for the cardón, has found some degree of general acceptance. But, up to now, the chagual has been known either by various names which are botanically incorrect, or it has had to share a botanical name with a smaller and more Southern relative. This confusion appears to be mainly due to two contributory causes :—

(1) Puyas are awkward plants to press ; and consequently herbarium material often consists only of bits of leaves and small portions of flower spikelets, which together give little idea of the habit of the plant in question and may be inadequate to differentiate nearly allied species.

(2) The type specimens are mostly to be found in herbaria in Europe, and not in Chile, and were made from material grown from plants, or seed, sent from Chile many years ago, often without adequate details of the localities from which they were originally obtained. Thus Chilean botanists are not in a position, without bulky and inconvenient correspondence, to compare Chilean material of today with the type specimens grown and named in Europe many years ago. Differences of opinion have consequently arisen over the identification and correct naming of the species growing in Chile, or in cultivation in Great Britain.

*H. O. Wagner. "Food and Feeding Habits of Mexican Humming-birds". *Wilson's Bulletin*, Vol. 58. No. 2. Conclusion. pages 90 & 91.

1. *Puya chilensis* Mol., near Valparaiso, 1908. Photograph by author.

2. *Puya berteroniana* Mez, near Valparaiso, 1908. Reproduced from a photograph by the author in Trans. & Proc. Bot. Soc. Edin. XXIV, p. 72, t. 8, 1910.

Plate 2

3. *Puya caerulea* Lindl. in the O'Higgins province of Chile. Photograph by G. Looser.
4. *Puya alpestris* Gay. May 1949 (seed from Six Hills Nurseries). Photograph by Botany Dept., Univ. of Birmingham.
5. *Puya venusta* Phil. in Aconcagua province of Chile. Photograph by G. Looser, 1932.

This confusion is illustrated by the following circumstances :—

All but the most erudite Chilean botanists believe that the correct name for the chagual is " *Puya caerulea* ".* But such is not the case, for that name (however appropriate it may seem to be for it) was long ago given, by Lindley, to a smaller and rarer plant of the subgenus *Chagualia*, proposed by Smith and Looser, in which the spikelets are clad in flowers, or flower buds, to their tips, (fig. 3) (See also Bot. Reg. t.11. 1840).

In 1864 a certain Mr. Mark Whyte sent home from Chile living material of a blue-green flowered Puya, which was duly figured, in 1868, in the Botanical Magazine (t. 5732), and therein named " *Puya whytei* Hook fil ". But its Chilean locality was not recorded !

During a visit to Chile in 1884 Miss Marianne North made fine pictures of the chagual growing about Apoquindo (near Santiago). In the catalogue the species is described as " *Puya whytei* ". (See Official Guide to the North Gallery at Kew, pictures 25 and 26). I followed this official Guide in calling this species " *Puya whytei* " when I photographed a plant near Valparaiso in 1908. (Fig. 2. Reproduced from Trans. & Proc. Bot. Soc. of Edin. XXIV p. 72 t.8 1910).

During plant collecting expeditions to Chile between 1927 and 1930 Mr. Clarence Elliott and I came across the chagual in several places ranging from Coquimbo in the North to Baños de Cauquenes in the South, and were duly taught to call it by the incorrect name " *Puya caerulea* ". Travelling southwards into a wetter region near Concepción, we came across a group of blue-green flowered Puyas, very similar to the chagual of further North, but much smaller—four to five feet as opposed to the other's eight to ten feet or more—and with sparse inflorescences of fifteen to twenty spikelets, as compared with sixty to a hundred or more in the Central Chilean plant. Rooted portions of this smaller species were brought home and subsequently flowered. By cross-pollination between flowers from two different plants, seed was obtained and distributed. Some of the resulting seedlings have since then reached the flowering stage (fig. 4). When a flowering plant was shown at Chelsea in 1936, it was identified as *Puya alpestris* Gay and obtained a well deserved Award of Merit.† First discovered near Antuco Volcano in 1833, by Poeppig and Endlicher, it was at first called *Pourretia alpestris*. But in 1853 Claudio Gay transferred it to *Puya*, as *Puya alpestris*, although he included under that name the larger more northern chagual.

In 1935, Dr. Lyman B. Smith (then of Harvard University, Cambridge, Mass., U.S.A.) and Señor Gualterio Looser (of the Chilean Academy of Natural Sciences, Santiago, Chile) published a paper on the Chilean Puyas.‡ Under *Puya alpestris*, two illustrations of typical compound flowering spikes were shown : one of the small Southern type, from Poeppig's original illustration of " *Pourretia alpestris* ", and the other from a photograph taken by Looser of the typical dense spike, as seen in the Santiago district, showing that they recognised it as occurring in two forms.

*N.B. *caerulea* is the correct spelling in classical Latin, but many botanists prefer to spell it " *coerulea* ".

†For drawing by John Nash, and description, see "Plants with Personality" by Patrick M. Synge, pp. 147-152.

‡Las especies Chilenas del género Puya. (Extracto de la " Revista Universitaria ", Universidad Católica, Año XX, No. 3, Julio de 1935), pp. 241—279.

But, not long ago I received a letter from Señor Looser, dated June 14th 1951, telling me that he had paid a visit in 1934 to the Concepción region, and had there seen the smaller type originally discovered by Poeppig and Endlicher, and collected again by Clarence Elliott and myself. Noting its smaller size, less dense spike and somewhat darker flowers, Looser realized at once that this was the genuine *Puya alpestris* of Poeppig and Endlicher, and that the larger northern form was of a different species. Moreover, with the despatch of herbarium specimens to Dr. Lyman B. Smith, he succeeded in convincing that noted authority on the family *Bromeliaceae* that the two forms were specifically distinct. For the larger form he proposed to use the name *Puya whytei*, if indeed the plant, figured under that name in Bot. Mag. t.5732, could be shown to correspond with herbarium material from the Central Chilean area, or with samples of the same in cultivation in Great Britain.

After receiving a copy of Señor Looser's letter, Major A. A. Dorrien-Smith kindly sent to the Kew Herbarium from Tresco Abbey, Isles of Scilly, samples growing there of the larger and smaller blue-green flowered Chilean Puyas.

I obtained from Major J. F. Harrison, of King's Walden Bury, Hitchin, and sent to Kew, a leaf of a Puya, grown from seed collected by Mr. Clarence Elliott at Baños de Cauquenes in 1927. (The Field Note stated :—" C.E.151. *Puya coerulea.* 3000–4000 ft. Baths of Cauquenes. Flowers blue-green. Height 10–12 feet. Seed obtained."). *The leaf of this plant, and also that of the larger one from Tresco Abbey, proved to be identical with the Kew Herbarium specimens of the larger blue-green flowered Puyas from Baños de Cauquenes and Curico. This is the species figured in Miss Marianne North's pictures under the name " *Puya whytei* ".

The herbarium material shows that the leaves of the plants from Baños de Cauquenes and Curico are distinctly scaly on the upper surface, while, in *P. alpestris* from the Concepción region, they are quite glabrous above. It has now been shown that the small southern and the larger northern blue-green flowered Puyas maintain their distinctive characters when grown in Great Britain.

But meanwhile Mr. J. R. Sealy and Mr. N. Y. Sandwith, of the Herbarium at Kew, have stated :—" We consider that, from the evidence of Hooker's description and plate, and of the material from the type plant preserved in the Herbarium, *Puya whytei* Hook. fil. is the " Southern plant " of Chile, and therefore a synonym of *P. alpestris* (Poepp.) Gay. . . . . If the ' northern plant ' is to be treated as a species separate from *P. alpestris*, it may have to be called *P. berteroniana* Mez, although the application of that name seems rather doubtful, as its leaves were never described. In our opinion, it must *not* be called *P. whytei*, which is conspecific with the ' Southern plant ' (*P. alpestris*)."

Dr. Lyman B. Smith, writing to Kew from the Smithsonian Institution in Washington, on September 27th 1951, stated :—" The case for *P. berteroniana* is on circumstantial evidence. It came from near Valparaiso,

*For description and photograph of Major Harrison's plant see " Puya Coerulea and its Pigmy Form " by Clarence Elliott. Gardening Illustrated. March 1947, pp. 1012 and 1012.

the centre of the Northern species, but had no leaves, and Mez only inferred it must be large from fragments. Still I do not see how you can avoid using it for the northern species if you divide *Alpestris*."

Carl Mez based his species* *Puya berteroniana* on a specimen in the Paris Herbarium—scrappy material, without leaves,—collected about a hundred years ago in the comparatively well botanised Santiago–Valparaiso region. The flower spikelets were so young that it was not easy to say whether or not their terminal bracts were sterile. Mez considered that they were not, and so placed the species in his sub-genus *Pitcairniopsis*, which at that date included 3 species which were later separated by Smith and Looser as their subgenus *Chagualia*. When the type material was subsequently re-examined by Dr. Raymond Benoist, he found (as Smith and Looser, from photographs of the type material, had suspected†) that the apical bracts were indeed sterile, thus placing the species in the sub-genus *Puya*. The flowers were said to be blue. No species of *Puya* from the Santiago–Valparaiso district answers to this description, other than the one painted by Marianne North in 1884 about Apoquindo, near Santiago.

I have been asked by a number of horticulturalists how *Puya berteroniana* can be distinguished from *P. alpestris*, *P. chilensis*, *P. caerulea* and *P. venusta* :—(A) when flowering, and (B) when not in flower.

The Chilean Puyas belong to two sub-genera :—

I. *Puya* (formerly known as *Eupuya*) in which the main spike, and the distal ends of the spikelets are clad in sterile bracts only. Upper surface of petals smooth.

To I belong *Puya berteroniana*, *P. alpestris* and *P. chilensis*.

II. *Chagualia* (of Smith and Looser) in which the upper portion of the main spike and the distal ends of the spikelets are clad to their tips with flowers or flower buds. Upper surface of petals with two longitudinal raised portions at their base.

To II belong *Puya caerulea* (including *P. violacea*), *P. venusta* and possibly a few others not in cultivation in Great Britain.

(*A.*) The flowering spikes are as follows :—

I. *Puya berteroniana* :—Dense spike, 10 to 12 feet high, with 80–100 or more spikelets, flowers blue-green. (Fig. 2).

P. alpestris :—Lax spike, 4–5 feet high, with 18–20 or less spikelets, flowers blue-green. (Fig. 4).

P. chilensis :—Dense spike, 10–15 feet high or more, with 80–100 or more spikelets, flowers greenish yellow. (Fig. 1).

II. *P. caerulea* :—Lax spike, 4–5 feet high, 10–20 spikelets or less, flowers dark blue, and clearly separated one from another. (Fig. 3).

*Das Pflanzenreich IV, 32 (Bromeliaceae)

†Lyman B. Smith and Gualterio Looser, "Revista Universitaria", Universidad Católica, Ano XX, No. 3, Julio de 1935. Puya Berteroniana p. 262.

P. venusta :—Lax spike, 4 to 5 feet high, with 8–10 spikelets but often undivided, with terminal spike only, flowers deep reddish violet, densely crowded at ends of spike and spikelets. (Fig. 5).

(*B.*) When not in flower, the leaves only can be examined :

I. *Puya berteroniana* :—Leaves about 2 inches broad at base, recurved, with dense coating of white scales below, and thin but distinct coating of scales above.

P. alpestris :—Leaves about ½ to an inch broad at base, recurved and with dense coating of white scales below, glabrous and bright green above.

P. chilensis :—Leaves about 2 inches broad at base, only slightly curved towards tips, dark green and more deeply channelled than in *P. berteroniana* or *P. alpestris*. Very few scales above or below.

II. *P. caerulea* :—Leaves less than an inch broad, 16–24 inches long, with dense coating of white scales above and below.

P. venusta :—Low cushions of spherical rosettes, leaves narrowly triangular, 8–12 inches long, densely scaly on both sides, but on the upper surface with fine scales only when very young.

(*P. caerulea* and *P. venusta* are not easily distinguishable when young).

I am indebted to Mr. N. Y. Sandwith and Mr. J. R. Sealey of Kew for advice on technical points, to the University of Birmingham for the photograph of *Puya alpestris*, and to Señor Gualterio Looser for information and photographs of *P. caerulea* and *P. venusta*.

Voyage of the " Beagle ".*—This reprint of Charles Darwin's "Journal of Researches into the Geology and Natural History of the various countries visited by H.M.S. Beagle " is a facsimile reproduction of the very rare first edition published in 1839.

Darwin was only twenty-five years of age when he returned, on October 6, 1836, from the voyage which proved to be not only an education, but also provided him with unlimited opportunities to pursue his interest in natural history and geology. It undoubtedly had a great influence on his career and his impressions of the fossils, animals, and of the life in the countries visited, turned his thoughts to evolution, the study of which resulted, many years later in the publication of his " Origin of Species ".

The reprint, which forms the second volume of a new series under the title " Pallas " has been reproduced in an excellent manner. It will be welcomed by all students and biologists and should stimulate interest in this memorable voyage of exploration and research. H. S. Marshall.

*Journal of Researches into the Geology and Natural History of the various Countries visited by H.M.S. Beagle. By Charles Darwin (1839). Facsimile Reprint of the First Edition. New York & London : Hafner Publishing Co. 1952. Pp. xiv. + 615. Plates 16. Price $7.50. (55/-).

THE ALBIZZIA GUMMIFERA COMPLEX.

J. P. M. Brenan.

In Kew Bull. **1930,** 218–9 (1930) C. A. Smith published a note on the botanical name of the " Flat-crown " tree in which he made the new combination *Albizzia gummifera*, which has ever since been generally accepted as the right name for this tree. But, unfortunately, it is not the last word ; Smith assumed that he was dealing with one species, but he was not. It is the purpose of this paper to show that there are three distinct species involved in *Albizzia gummifera*, together with a variety and an assortment of evident hybrids. The following key to these, together with the parents involved in the hybrids, should make things easier. Where the number of pairs of leaflets is mentioned in this key it refers to the two distal pairs of pinnae of well developed leaves ; the basal proximal pinnae have often much fewer.

Leaflets 3–6 pairs, the terminal pair larger than the others, the pinnae thus broadening upwards :

Leaflets not auriculate at base on the proximal side :

Leaflets normally 3–5 pairs, rarely 6 ; pinnae normally 1–3 pairs, rarely 4 :

Bracts at base of peduncles also stipules broadly ovate or suborbicular, to 1·5 cm. broad ; leaflets ± thinly pubescent all over beneath; terminal leaflets acute or subacute at apex ; young darts densely pubescent . **A. grandibracteata** *Taub.*

Bracts at base of peduncles also stipules very small and inconspicuous, linear, about 1 mm. broad ; leaflets glabrous beneath except on midrib and margins ; terminal leaflets obtuse at apex ; young parts minutely puberulous **A. zygia** (*DC.*) *Macbr.*

Leaflets rarely as few as 6 pairs and then normally accompanied by pinnae with more pairs on other leaves ; pinnae 3–6 pairs **A. gummifera** × **zygia** (p. 531)

Leaflets auriculate at base on the proximal side :

Bracts and stipules ± broadly ovate ; leaflets beneath with sparse hair between midrib and margins, often acute or subacute at apex ; peduncles ± densely pubescent **A. grandibracteata** × **gummifera** (p. 530)

Bracts and stipules narrow, lanceolate ; leaflets glabrous beneath except on midrib and margins, obtuse at apex ; peduncles very thinly pubescent . . . **A.** ? **intermedia** × **zygia** (p. 532)

Leaflets 7 pairs or more :

Leaflets not auriculate at base on the proximal side, though the proximal margin may be ± rounded to the insertion of the petiole :

Terminal leaflets rather larger than the rest, the pinnae thus ± broadening upwards ; pinnae 3–6 pairs ; leaflets (6–) 7–9 pairs :

Leaflets very thinly pubescent on lower surface between midrib and margins ; bracts and stipules broadly lanceolate to ovate :

Bracts and stipules broadly lanceolate to ovate, 2–3 mm. wide ; uppermost leaflets obtuse to subacute

A. adianthifolia × **zygia** (p. 529)

Bracts and stipules usually broadly ovate, 4–8 mm. wide ; uppermost leaflets acute

A. grandibracteata × **gummifera** (p. 530)

Leaflets glabrous beneath except on midrib and margins ; bracts and stipules narrowly lanceolate

A. gummifera × **zygia** (p. 531)

Terminal leaflets rather smaller than the rest, the pinnae thus ± narrowing upwards ; pinnae 4–9 pairs (rarely as few as 3 and then only on occasional reduced leaves) ; leaflets 9–17 pairs :

Young parts, rhachides of leaves and pinnae finely and shortly pubescent ; leaflets pubescent beneath only on midrib and margins, glabrous between or rarely, especially when young, some occasional hairs on primary lateral nerves ; stipules lanceolate, up to 6–7 × 2–2·5 mm. ; pods glabrescent

A. gummifera var. **ealaënsis** (*De Wild.*) *Brenan* (p. 518)

Young parts, rhachides of leaves and pinnae densely fulvous-pubescent ; leaflets ± pubescent all over lower surface ; stipules ovate, about 5–9 × 3–6 mm. ; pods ± densely and persistently pubescent

A. adianthifolia (*Schumach.*) *W. F. Wight* (p. 520)

Leaflets markedly auriculate at base on the proximal side :

Terminal leaflets rather larger than the rest, the pinnae thus ± broadening upwards ; bracts and stipules lanceolate to ± broadly ovate ; leaflets not more than 10 pairs ; pinnae 2–5 pairs :

Bracts and stipules ± broadly ovate ; leaflets beneath with sparse hair between midrib and margins, often acute or subacute at apex ; peduncles ± densely pubescent

A. grandibracteata × **gummifera** (p. 530)

Bracts and stipules narrow, lanceolate ; leaflets glabrous beneath except on midrib and margins, obtuse at apex ; peduncles very thinly pubescent . **A.** ? **intermedia** × **zygia** (p. 532)

Terminal leaflets rather smaller than the rest, the pinnae thus ± narrowing upwards ; bracts and stipules normally lanceolate, narrower than above ; leaflets 9–16 pairs ; pinnae 4–7 pairs (rarely as few as 3 and then only on occasional reduced leaves) :

Leaflets pubescent beneath only on midrib and margins, glabrous between or rarely, especially when young, some occasional hairs on primary lateral nerves

A. gummifera (*Gmel.*) *C. A. Sm.* (p. 511)

Leaflets pubescent beneath on midrib and margins, and pubescent or puberulous on the surface between, often very inconspicuously so :

Calyx 1·5–2 mm. long ; bracteoles at falling very short, 0·6–1·5 mm. long ; pubescence on young parts very short, dense and ochraceous-brown

A. intermedia *De Wild. et Dur.* (p. 519)

Calyx normally more than 2·5 mm. long ; bracteoles at falling more than 2 mm. long ; pubescence on young parts longer, coarser and usually a deeper rusty-brown

A. adianthifolia × **gummifera** (p. 528)

In the following account no attempt has been made to give complete citations of specimens for *A. gummifera* and *A. adianthifolia*, as they are so many that I do not feel that it would be sufficiently useful. I am therefore only giving a selection drawn from the most widespread or significant ones from each territory. In addition I have restricted the bibliography to the most important references.

The following abbreviations for herbaria are used :—

K = Royal Botanic Gardens, Kew.
LISC = Herbarium of the Junta de Investigaçoes Coloniais, Lisbon.
IFI = Imperial Forestry Institute, University of Oxford.
ENT = Herbarium of the Uganda Forest Department.
BM = British Museum, Natural History.
B = Brussels.
EA = East African Herbarium, Nairobi, Kenya.

I must thank sincerely the directors of the above Institutions and the keepers of their herbaria for the privilege of seeing their specimens. Particularly must I single out Mr. A. C. Hoyle for the loan of photographs and permission to publish them, and Mr. W. J. Eggeling for his great help. I must also acknowledge much help from my colleagues, particularly Mr. E. Milne-Redhead ; also from Mr. H. C. Dawkins and Mr. R. W. J. Keay.

Since perhaps the most important conclusion reached in this paper is that splitting of *A. gummifera* (in its old wide sense) into three species, *A. gummifera* (Gmel.) C. A. Sm., *A. intermedia* De Wild. et Dur. and *A. adianthifolia* (Schumach.) W. F. Wight, a table of the differences between these three species (on p. 510) may be helpful :—

A. gummifera (Gmel.) C. A. Sm.

Bark smooth, sometimes rough.

Young stems finely and shortly pubescent, glabrescent and usually going deep or blackish purple with numerous and conspicuous pale lenticels.

Stipules and bracts at base of peduncles lanceolate, up to about 6–7 mm. long and 2–2·5 mm. wide.

Rhachides of leaves and pinnae shortly thinly and inconspicuously pubescent, rhachis of pinnae glandular between the 4–7 distal pairs of leaflets, rarely 0–10 pairs glandular.

Leaflets subglabrous, usually somewhat pubescent only on midrib and margins.

Raised venation on lower surface of leaflets lax.

Posticous margin of leaflets with a conspicuous auricle just above junction with petiolule, the lower side of the auricle parallel with the rhachis of the pinna. [Auricle] absent in var. *ealaënsis*.]

Peduncles thinly pubescent.

Bracteoles inconspicuous, normally shorter than flower-buds (except when extremely young), linear, 2·6 mm. long at time of falling (or in var. *ealaënsis* as short as 1–1·5 mm.), normally more persistent than in *A. intermedia*.

Calyx 2·5–5 mm. long, rarely only 1·5–2 mm. long.

Pubescence on outside of calyx and corolla usually minute, very short and rather appressed.

Pods pale brown to reddish-brown or purplish, glabrescent, glossy, less prominently and closely venose than in *A. adianthifolia*.

A. intermedia De Wild. et Dur.

Bark unknown.

Young stems densely but shortly pubescent, pale ochraceous-brown, remaining brown and persistently pubescent until coated with grey bark ; lenticels not very numerous or conspicuous.

Stipules and bracts at base of peduncles very caducous and inconspicuous, oblong-elliptic, about 4·5 mm. long and 2 mm. wide.

Rhachides of leaves and pinnae densely but very shortly ochraceous-pubescent ; rhachis of pinnae glandular only between the distal pair of leaflets.

Leaflets pubescent beneath on midribs and margins, the surface between clothed with a minute appressed persistent puberulence.

Raised venation on lower surface of leaflets lax.

Posticous margin of leaflets with a conspicuous auricle just above junction with petiolule, the lower side of the auricle parallel with the rhachis of the pinna.

Peduncles very shortly but densely pubescent.

Bracteoles very minute and inconspicuous, shorter than flower-buds, linear-spathulate, 0·6–1·5 mm. long at time of falling, very caducous and falling while the buds are still young.

Calyx 1·5–2 mm. long.

Pubescence on outside of calyx and corolla minute, very short and rather appressed.

Pods pale brown, minutely and persistently pubescent, not glossy, prominently venose, usually more transversely so than in *A. adianthifolia* ; pods slightly wider than is usual in *A. adianthifolia* and *A. gummifera*.

A. adianthifolia (Schumach.) W. F. Wight

Bark roughly fissured, corky, rarely smooth in east Africa, but commonly so in west Africa.

Young stems densely or very densely and coarsely rusty- to fulvous-pubescent, pubescence persistent, usually remaining brown and with less conspicuous lenticels but rapidly becoming coated with grey bark.

Stipules and bracts at base of peduncles ovate, about 5–12 mm. long and 3–6 mm. wide.

Rhachides of leaves and pinnae ± densely and coarsely fulvous-pubescent ; rhachis of pinnae glandular between the 1–4 distal pairs of leaflets.

Leaflets rather plentifully and somewhat appressedly pubescent all over lower surface and margins.

Raised venation on lower surface of leaflets close.

Posticous margin of leaflets straight or curved at junction with petiolule, but not auriculate.

Peduncles densely pubescent.

Bracteoles exceeding flower-buds, linear-spathulate to oblanceolate, 5–8 mm. long at time of falling, variably persistent but normally more so than in *A. gummifera*.

Calyx 2·5–4 mm. long, rarely as short as 2 mm.

Pubescence on outside of calyx and corolla denser and spreading.

Pods normally pale brown, ± densely and persistently pubescent, not glossy, prominently venose.

Albizzia gummifera (*Gmel.*) *C. A. Sm.* in Kew Bull. **1930,** 218–9 (1930), pro parte, excl. syn. *Mimosa adianthifolia* ["*adiantifolia*"], *Zygia fastigiata* et *Albizzia fastigiata*; Lebrun, Essences Forest. Rég. Montagn. Congo Orient. (Publ. de l'I.N.E.A.C., sér. sci. 1), 93–95 (1935), quoad descr. pro parte et quoad icon.; Brenan in Check-Lists For. Trees & Shrubs Brit. Emp. 5 (Tang. Terr., pt. 2), 339–40 (1949), pro parte, quoad "Species A" tantum.

Sassa gummifera Gmel., Syst. **2** (**2**), 1038 (1791).

Inga sassa Willd., Sp. Pl. **4** (**2**), 1027 (1806); DC., Prod. **2,** 440 (1825).

Mimosa sassa (Willd.) Bruce ex Poir., Dict., suppl. **1,** 49 (1810).

Zygia sassa [(Willd.)] Benth. ex Schweinf., Reliq. Kotschyanae, 10 (1868), in obs.

[*Albizzia fastigiata* (non E. Mey.) Oliv.)—Benth. in Trans. Linn. Soc. **30,** 570 (1875), pro parte, quoad syn. *Inga sassa* et *Mimosa sassa* tantum; Eyles in Trans. Roy. Soc. S. Afr. **5** (**4**), 361 (1916).]

Feuilleea sassa (Willd.) O. Ktze., Rev. Gen. **1,** 186 (1891).

Acacia sassa (Willd.) Baill. in Drake del Castillo, Hist. Nat. Pl. Madag. **1,** 71 (1902).

Albizzia sassa (Willd.) Chiov., Monogr. Rapp. Colon., Roma (Etiopia: Osserv. Bot. Agrar. Indust.) No. **24,** 103 (1912); Macbride in Contrib. Gray Herb. **59,** 4 (1919); Bak. f., Leg. Trop. Afr. 868 (1930), pro parte, quoad syn. *Sassa* Bruce, *Mimosa sassa* et *Albizzia mearnsi* ["*mearnsii*"] tantum.

Albizzia mearnsi De Wild., Pl. Bequaert. **3,** 51–2 (1925); Baker f., Leg. Trop. Afr. 869 (1930) sub *A. sassa* [as "*A. Mearnsii*"].

Albizzia laevicorticata Zimm. ex Hora et Greenway, Check-Lists For. Trees & Shrubs Brit. Emp. **5** (Tanganyika Terr. pt. 1) 23 (1941), nomen nudum; Brenan, *op. cit.* pt. 2, 343 (1949).

In addition to the above synonymy *Albizzia fastigiata* (E. Mey.) Oliv. var. *glabra* Vatke, mentioned as a *nomen nudum* in Engl., Pflanzenw. Ost-Afr. **C,** 193 (1895) is no doubt to be referred here. *Holst* 2291a (Tanganyika Territory) and *Hildebrandt* 3123 (Madagascar), both issued from Berlin as var. *glabra*, are both typical *A. gummifera*.

Medium to large *tree* up to 30 m. high, with smooth or sometimes rough grey bark and flattened crown. *Young stems* finely and shortly brownish-pubescent, soon glabrescent and usually deep or blackish-purple with numerous and conspicuous grey lenticels, ultimately grey-barked. *Stipules* and bracts at base of peduncles lanceolate, up to about 6–7 mm. long and 2–2·5 mm. wide. *Leaves* with 5–7 pairs of pinnae (rarely only 3 on occasional reduced leaves; leaflets in 9–16 pairs, the terminal ones rather smaller than the rest, the pinnae thus ± narrowing upwards, the distal 4–7 pairs (rarely 0–10 pairs) glandular; leaflets obliquely rhombic-quadrate to rhombic-subfalcate, obtuse to acute at apex, conspicuously auriculate at base on proximal side, subglabrous or somewhat pubescent on midrib and margins, rarely, especially when young, some occasional hairs on the primary lateral nerves, raised venation beneath lax, leaflets mostly about 1–1·7 cm. long and 0·4–0·8 cm. wide. *Flowers* capitate. *Bracteoles* linear, inconspicuous, 2–6 mm. long, normally shorter than the flower-buds except when extremely young.

FIG. 1. Pinnae and portions of their rhachides, all × ⅔. 1, *Albizzia gummifera* ; 2, *A. adianthifolia* ; 3, *A. intermedia* ; 4, *A. grandibracteata* ; 5, *A. grandibracteata* × *gummifera* ; 6, *A. zygia* ; 7, *A. gummifera* × *zygia* (*Welwitsch* 1770) ; 8, *A. gummifera* × *zygia* (*Eggeling* 254) ; 9, *A. adianthifolia* × *zygia*.

Calyx 2·5–5 (very rarely indeed 1·5–2) mm. long and about 1 mm. in diameter, minutely shortly and rather appressedly brownish-pubescent. *Corolla* white, tube 6–8 mm. long, lobes 2–3 mm. long and 0·75–1 mm. wide. *Staminal tube* exserted about 2 cm. beyond corolla, white below, crimson above. *Pods* pale brown to reddish-brown or purplish, glabrescent, glossy, less prominently and closely venose than in *A. adianthifolia*, 10–18 cm. long, 2–3 cm. wide.

British Cameroons. Bamenda Division : Gully above Bamenda, alt. 1980 m., 28 Jan. 1928, *Migeod* 416 (K, BM) :—tree ; flowers paniculate, white, scented, with long pink stamens. Bamenda, alt. 1370 m., Mar. 1931, *A. T. Johnstone* J 171/31 (IFI). Bamenda, alt. 1525 m., Jan. 1932, *A. T. Johnstone* J 272/32 (K, IFI). Path from Belo to Lake Oku, alt. 1680 m., 6 Jan. 1951, *Keay & Lightbody* FHI 28463 :—in farmland ; tree 4 m. high (but often seen up to 20 m. high) ; corolla white ; staminal tube crimson, white at base.

Belgian Congo. District des Lacs Édouard et Kivu : Ruwenzori, valley of the Muboka, Nov. 1931, *Lebrun* 4419 (K, IFI). Between Kasindi and Lubango, Kibali-Ituri, Dec. 1932, *Lebrun* 4706. Same locality, Jan. 1932, *Lebrun* 4813 (K, IFI). Kivu, Luzira (S. Kalibe), Apr. 1932, *Lebrun* 5415. Between Masisi and Kivu, 1937, *Ghesquière* 4969. Ruanda-Urundi : Near Irubura, 30 May 1926, *Robyns* 2395. Road from Kitega to Kisozi, 15 July 1933, *J. Lejeune* 70.

Anglo-Egyptian Sudan. Equatoria Province : Didinga Mtns., Mt. Lotuke, alt. 1950–2010 m., 20 Apr. 1939, *Myers* 10966 :—vernacular name (Didinga) " cherokoich ". Imatong Mtns., near Mt. Garia, alt. 1830–2130 m., 13 June 1939, *Andrews* A 1877 :—tall tree with smooth bark, abundant : vernacular name (Latuka) " alari ".

Uganda. Western Province, Toro District : Mpanga R., alt. 1525 m., 1903, *Dawe* 500 :—spreading tree 6–7·5 m. high. E. Ruwenzori, alt. 2130 m., May 1939, *Sangster* S 539 (IFI) :—tree to 14 m. Same locality, altitude and date, *Sangster* S 540 (K, EA) : —tree 15 m. ; bark smooth, sycamore-like, exuding gum ; a forest relic : vernacular name (Konjo) " omukundusebere ". Ankole District : Bugamba Forest, Mar. 1939, *C. S. Cree* C 242 (as to foliage, excluding pods, which belong to *A. adianthifolia*) (IFI, ENT) :—tree 4·5 m. high ; bark rough and blackened ; on forest edge [? whether the notes refer to the tree from which the foliage was collected—J. P. M. B.]. E. Ruampara, Nov. 1946, *Sangster* 887 (ENT), *Sangster* 887A (ENT) :—tree 12 m. high. E. Ruampara, Rwoho, alt. 1680 m., Sept. 1947, *M. S. Philip* 12 (ENT) :—near edge of forest, associated with *Celtis kraussiana*, *Markhamia platycalyx* and *Sapium ellipticum* ; tree 12 m. high ; bark smooth, grey, very thin, 3 mm. yellow beneath ; wood white : vernacular name (Lungankole) " omushebeya ". Same locality and date, *M. S. Philip* 15 (ENT) :—in open near forest-edge ; larger tree 14 m. high with spreading flat crown ; bark smooth, grey, with green-grey patches, very thin, 1·5–3 mm. yellow beneath : vernacular name (Lungankole) "omushebeya " (also given for *Philip* 18, 19, 25 ; see below). Same locality and date, *M. S. Philip* 18 (ENT) :—tree 17 m. high ; bark light grey-green, very thin, 0·75 mm., over 3 mm. of yellow inner bark ; wood white ; leaflets glossy ; pods papery. Same locality and date, *M. S. Philip* 19 (ENT) :—notes similar to those of *Philip* 15 (see above). Same locality and date, M. S. Philip 24 (ENT) :—small tree with bark as in *Philip* 15 ; leaves dark green and glossy above, pale and dull beneath ; flowers white ; staminal tube and stigma red. Same locality and date, *M. S. Philip* 25 (ENT) : —tree 17 m. high, in forest, associated with *Dracaena steudneri* ; bark as in *Philip* 15. Kigezi District : Irunga, 18 Nov. 1903, *Bagshawe* 383 (BM) :—tree with white flowers. Virunga Mountains, between Lugahinga and Sabinio, alt. 2130 m., 1932 3, *Eggeling* 1055* (K, EA). Kigezi, Bihungi, alt. 2440 m., Feb. 1933, *Eggeling* 1054 (ENT) :—tree 11 m. high ; flowers whitish-brown, the staminal tube and anther-brush dark-red. In forest near Mpororo, Dec. 1938, *C. S. Cree* C/205 (IFI) :—tree to 18 m., with pink or white flowers. Kachwekano Farm, alt. 2070 m., Sept. 1949, *Purseglove* P. 3118 :—hillside thicket ; tree 9 m. high ; flowers white with red-tipped staminal tube. Buganda Province, Masaka District : Kabula, near the border of Ankole District, alt. 1430 m., Oct. 1932, *Eggeling* E. 690 (ENT) :—tree 6 m. high ; flowers white with pink staminal tube.

Kenya? Rift Valley Province, Trans-Nzoia District : S.E. Mt. Elgon, alt. 1980–2130 m., Jan. 1931, *T. H. E. Jackson* 336 (K, EA) :—tall, straight forest tree 15–18 m. high ; flowers scented, central one in head white, others white with red stamens : vernacular name " seswet ". Mt. Elgon, alt. 1980 m., 23 Jan. 1931, *Major E. J. & Mrs. Cyril Lugard* 511 (K, EA) :—tree to 10 m. high with large spreading crown ; flowers white with crimson stamens ; pod brown. Mt. Elgon, alt. 2130 m., Jan. 1933, *Mrs. E.*

*I suspect that there may have been a muddle in labelling, and that this specimen is in reality *Eggeling* 1054.

Jack 434 (K, EA). Rift Valley Province, Nandi District : Nandi, alt. 2070 m., *E. C. M. Green* 34 (K, EA) :—very common in this area ; usually riparian but can also be found on hillsides growing in rich soil ; long straight grey stem with dark green bushy crown. Nandi Escarpment, Makong R., alt. 1980 m., 8 Nov. 1938, *Green* 20 (EA). Same locality, altitude and date, *Green* 21 (EA) :—large tree ; clean stem ; dark green foliage ; flowers purple and white : vernacular name (Nandi) " set ". Kaimosi, 8 Mar. 1927, *Shantz* 127 (K, IFI). Laikipia District. *D. G. B. Leakey* 1267 (IFI). Nakuru District : Growing in clumps along banks of Makalia R., Nakuru Lake Forest, alt. 1980 m., Dec. 1930, *E. J. Honoré* 476 (IFI, EA) :—a spreading flat-topped tree to 18 m. high ; flowers red and white : vernacular name (Kik.) " mukuruwe ". Lumbwa Endabarra, Mau Forest, alt. 2220 m., 23 Jan. 1946, *Bally* 4949 :—forest edge, also in forest : vernacular name " seht ". Central Province, ? N. Nyeri District : Nyeri, alt. 1980 m., *R. V. H. Porter* 936T (IFI, EA). Fort Hall District : Near Fort Hall, alt. c. 1200 m., 10–12 Sept. 1909, *Dr. Edgar A. Mearns* 1197 (BR, BM, typus *A. mearnsi* De Wild.) Kiambu District. Impey's Bridge, Limoru, 15 Nov. 1934, *van Someren* 6938 (EA). Kabete, 7 m. W. of Nairobi, alt. 1830 m., 23 July 1947, *Bogdan* 925 :—single tree on a grass slope. Nairobi District. Nairobi, garden at Riverside, planted, Nov. 1949, *Bally* 7656. Machakos District : Chyulu N., alt. 1580 m., 29 May 1938, *Bally* 899 (8218) :—in grassland near forest-edge, only one immature tree found. Nyanza Province, N. Kavirondo District ? S. Elgon, Sosian R. and elsewhere, alt. 2030 m., Mar. 1941, *Mrs. Tweedie* 549 :—in woods and on forested river-banks ; tree of medium size ; flowers white and red, scented, found in June as well as March. N. Kavirondo District : Kakamega Forest, alt. 1680 m., *F. T. Machin* 873 T (IFI) :—tree : vernacular name (Kaki) " mukhunzuli ". Kericho District : Kericho, 24 Nov. 1903, *C. F. Elliot* 186 : vernacular name " mkuriwa ". Kedowa, river-banks, alt. 1980 m., Jan. 1906, *G. S. Baker* 335 : vernacular name (Kik.) " mkuriwi ". Masai Province : Ngong Forest near Nairobi, *H. M. Gardner* 1025 :—large timber tree : vernacular name " mukuruwe ". Forest, Ngong, alt. 1800 m., Dec. 1931, *Dr. van Someren* 1629 (K, EA) :—tall tree with unbranched bole ; flowers white with deep crimson staminal tube ; one white flower in centre with very short white staminal tube. Coast Province, Taita District : Taveta, Lumi River Forest, *H. M. Gardner* 2969 (K, EA) :—medium-sized tree : vernacular name (Taveta) "kiririgwi". Bura Hills, Oct. 1938, *Boy Joana* 8945 (EA). Wundanyi Hill, Oct. 1938, *Boy Joana* 8961 (EA) :—? Province, ? District : Nyanza Basin, alt. 1370–1520 m. *J. L. Moon* 575 (K, EA) :—large timber tree : vernacular name (Kav.) " Mughonzulu ". Alt. 1520–2440 m., *Conservator of Forests* 20 (O) :—vernacular name " mukuruwe ".

Tanganyika Territory. Northern Province, Moshi District : Kilimanjaro, S.E. side, alt. 1700 m, *Schlieben* 4621 (BM) :—tree 10–20 m. high, scattered in bush-land; flowers carmine. Western Province, Buha District : Kasulu Highlands near Mkalinzi, alt. 1520 m., July 1951, *Eggeling* 6193 :—in patch of relic forest ; large spreading tree 15 m. high ; outer branchlets drooping ; flowers white ; staminal tube red ; pods pale brown. Mbulu District : Nou Forest Reserve, Ufiome F.R., etc., alt. 1220–2130 m., Sept. 1934, *F. J. Ross* 902 (IFI) :—large tree : vernacular name (Kimbulu) "sokai ". Now Mtns., alt. c. 2130 m., 19 Dec. 1926, *B. D. Burtt* 652 (K, BM) :—a large forest tree c. 21 m. high, with smooth bark, in a ravine. Tanga Province, Pare District : Road to Longusa, 15 Oct. 1908, *Zimmermann* 2002 (EA) :—fairly tall tree. N. Pares, Kindoroko Forest Reserve, alt. 1220–1830 m., 10 Oct. 1928, *H. R. Herring* 374 (IFI) :—a fair timber-tree ; vernacular name " muranganji " or " mfuranji ". Lushoto District. Rain-forest, Nguelo, Feb. 1893, *Holst* 2291a. S. Pares, Tona to Wudee (locality 0.3.56), alt. 1900 m., 20 Feb. 1915, *A. Peter* K 489 :—tall tree 14 m. high, 1 m. thick. N. Pares, Kilomeni to Kissangara (locality 0.3.127), alt. 1640 m., 27 June 1917, *A. Peter* K 515 :—tree in forest. E. Usambaras, Dodwe, Oct. 1909, *Zimmermann* 2811. E. Usambaras, Sigi, 25 Oct. 1910, *Zimmermann s.n.* (K, IFI, BM, source of the name *A. laevicorticata* Zimm.). E. Usambaras, Amani, Bomole mountain (locality 0.1.5), alt. 1000 m., 9 Jan. 1914, *A. Peter* K1 :—tree in rain-forest. Rain-forest near Amani (locality 0, 1. 108), alt. 900 m., 11 May 1914, *A. Peter* K 454 :—tree. W. Usambaras, Bungu-Lutindi (locality 0.4.15), alt. 1050 m., 28 Feb. 1916, *A. Peter* K 561. W. Usambaras, Balangai-Mpalalu (locality 0.4.31), alt. 1160 m., 12 Mar. 1916, *A. Peter* K 274. W. Usambaras, Kalange to Mazumbi (locality 0.4.45) alt. 1450 m., 12 Apr. 1916, *A. Peter* K 573. E. Usambaras, Amani, alt. 915 m., 13 Feb. 1917, *A. Peter* K 328 :—tall tree ; flowers white. Sigi, 25 Oct. 1910, *Zimmermann* 7015 (EA). Sakarre, Jan. 1930, *W. Nowell* H40/29 (EA). W. Usambaras, *H. Gillman* 1001 (K, EA) :—medium-sized tree up to 15 m. high ; canopy not as extensive as " mshai mawe " and foliage is lost during dry period Dec.–Mar. ; for this reason not a suitable tree for coffee shade ; flowers Mar.–Apr. ; quick growing ; confined to altitudes 1200–2000 m. : vernacular name (Kishamb.) " mshai wawa ". Central Province, Kondoa District : Forest, Kinyassi Mtn., alt. c. 1980 m., 14 Dec. 1927, *B. D. Burtt* 925 (K, IFI, BM, EA) :—giant forest tree to 24 m. or more high ; bole with smooth grey bark ; in secondary forest : vernacular name (Irangi) " munjejia ". Same locality, 7 Feb. 1928, *B. D. Burtt* 1339 (K, IFI, EA) :—giant secondary-forest tree to 24 m. high or more, with smooth grey bark. Eastern Province, Morogoro District : Mbwiga, *Speke & Grant s.n.* Uluguru

Mtns., Silesian Mission to Lulango (locality 0.2.105), alt. 1300 m., 2 Nov. 1914, *A. Peter* K 468 :—tree to 30 m. Stream-valley in mist-forest, N.W. side of Uluguru Mtns., alt. 1240 m., 29 Sept. 1932, *Schlieben* 2750 (K, BM) :—large tree 20–25 m. high, very common ; flowers carmine-white, sweet-scented ; wood used for construction. In forest, alt. 1370 m., 16 Nov. 1932, *G. B. Wallace* 428 (K, EA) :—tree 15 m.h. ; flowers creamy-white, central parts red to very dark red ; used for timber ; vernacular name (Kisw., " mkengemazi ". Uluguru Mtns., Morningside, alt. 1310 m., 29 Oct., *Miss E. M. Bruce* 76 (K, BM) : on edge of forest : tree 12 m. high, abundant ; white petals, red stamens : vernacular name " mkengemazi ". Turiani, alt. 610 m., 3 June 1933, *B. D. Burtt* 4749 (K, BM) : riverine forest with *Adina*, *Khaya*, *Pandanus* etc. ; large tree over 24 m. high, common. Below Forest Office, Morogoro, alt. c. 580 m., 14 Oct. 1946, *Wigg* 1746 (IFI, EA) :—tree to 12 m. high and 30 cm. in diameter, fairly common on stream-side. Usaramo District : Dar-es-Salaam, Oct.–Dec. 1868, *Kirk s.n.* Dar-es-Salaam region, *Comm. W. D. Raymond* 80 (EA). Mafia Island : Mchangani, alt. c. 3 m., 26 Sept. 1937, *Greenway* 5325 (K, IFI, EA) :—local in closed *Syzygium cumini*, *Bridelia*, *Vitex doniana*, *Landolphia comorensis* var. *florida* evergreen forest on a black sandy soil ; a much branched tree up to 10 m. high with white flowers and bright red stamen-filaments ; used for making native beds and tool-handles : vernacular name (Kiswah.) " mkengeti ". Southern Highlands Province, Iringa District : Luganga, Sao, alt. 1860 m., 11 Dec. 1934, *Mr. & Mrs. Davies* 981 (K, EA) :—tree 9–12 m. high, with smooth bark : vernacular name " tangasale ". Mbeya District : Mbozi, *V. F. Jessel* 50 (K, EA). Rungwe District : Rungwe Stock, alt. 1400 m., 13 Oct. 1913, *Stolz* 2252 (K, IFI, BM, EA) : tree 8 m. h. with broad crown ; leaves green, shining ; flowers white with carmine-red stamens : vernacular names (Rungwe) " tangasale " (Ukinga) " tembelele ". Alt. 1530 m., 2 Oct. 1932, *Davies* D204 (K, EA) :—tree, smooth bark, fairly common. Njombe District : Njombe, 23 Dec. 1931, *Rear-Admiral H. Lynes* F.g. 41 :—large, spreading, important tree up to 21 m. high, common but nowhere very abundant. ? Province and District : Kimpela, 1921, *Swynnerton* 334 (BM).

Zanzibar. New Forest, 20 Oct. 1929, *Burtt Davy* 22647 (IFI). Without precise locality, *J. H. Vaughan* 47 (BM) :—tree. (—A form with very reduced auricles but no clear evidence of hybridity with *A. adianthifolia*, possibly near var. *ealaënsis*.. Without locality, 1931, *J. H. Vaughan* 1657.

Portuguese East Africa. Niassa Province, Moçambique District : Between Monapo and Quixaxe, 17 Oct. 1948, *G. Barbosa* 2467 (LISC, EA) :—tree 10–15 m. high, associated with *Adansonia digitata*, *Sterculia* sp. (" netil ") etc. ; bark little roughened, whitish ; stamens and styles carmine. Cabo Delgado District : Mecufi, 9 Oct. 1948, *F. L. Lermos s.n.* (EA) :—tree 8 m. high. Zambézia Province, Quelimane District : Between Nhamarroi and Ile (Erego), 25 Sept. 1941, *Torre* 3511 (K, LISC) :—tree from 6–10 m. high with white flowers, abundant on stream-banks. Serra da Morrumbala-Massingire, 6 Aug. 1942, *Torre* 4527 (LISC) :—tree 10–20 m. high, in dense forest. Milange District : Milange, 1 Sept. 1944, *F. A. Mendonca s.n.* :—tree 6–12 m. high with broad crown ; a shade-tree in tea-plantations. Tete District : Stream-banks near Zobue, 7 June 1941, *Torre* 2876 (LISC) :—tree 10 m. high. Manica e Sofala Province, Chimoio District. Mt. Xiroso near Mavita, 26 Oct. 1944, *Mendonca* 2657 (LISC) :—tree of wet forest. Moribane District : Between Vila Pery and Amatongas, 14 Feb. 1948, *Garcia* 238 (LISC) :—tree 15 m. high : vernacular name " mugeringi-fua ". Mossurize District : Kurumadzi R., alt. 610 m., 1906, *Swynnerton* 1392 (BM). A very common tree in the Mafuci Forests, Oct.–Nov. 1911, *Dawe* 477 :—vernacular name " mgerenge ".

Nyasaland. Kota-kota District : Msenjere, *P. Topham* 12 (IFI) :—vernacular name (Yao " chikwani ". Msenjere at Nchisi ?, *P. Topham* 58 (IFI) : vernacular name " ntangatanga ". Dedza District : Dedza Mtn., above head of gully, alt. 1920 m., 10 Sept. 1929, *Burtt Davy* 21568 (IFI). Zomba District : Zomba Plateau, alt. 1220 m., Jan. 1916, *Purves* 269 : —tree. Zomba, Oct. 1929, *J. B. Clements* 19 (IFI) : vernacular name (Yao) " mpumundu ". Zomba Plateau, alt. 140 m., 5 June 1946, *L. J. Brass* 16255 :—frequent in gulley rain-forest ; tree up to 12 m. high and 10–50 cm. diameter at breast-height, branches flat, spreading, forming a handsome pale-foliaged tree ; fruits immature. Blantyre District : Blantyre, *Buchanan* 86 : very large tree by stream ; trunk often 60–90 cm. in diameter ; flowers Sept.–Oct. Luchenza Stream, Limbe, *P. Topham* 613 (IFI) : vernacular name (N.) " ntangatanga ". Streams, Limbe, alt. 700 m., *R. G. R. Townsend* 78 (O) :—vernacular name (Y.) " chikwani ". Mlanje District : Mlanje, Chési, 19 Feb. 1915, *Mrs. Arthur Shinn s.n.* (BM). Cholo District : Cholo Mtn., 25 Sept. 1929, *Burtt Davy* 22170 (IFI) : vernacular name " tanga-tanga ". Cholo Mtn., alt. 1200 m., Sept. 25, 1946, *L. J. Brass* 17803 : —abundant in rain-forest canopy-layer ; tree to 30 m. high and 60 cm. in diameter, deciduous ; young leaves reddish, conspicuous in forest, buds only. Lower Shire District : Port Herald, Mtandwe Reserve, *P. Topham* 559 (IFI) : vernacular name (N.) " ntangatanga ". ? District : Shire Highlands, Zambesia, *Buchanan* 35 :—large tree. " Nyasaland ", 1891, *Buchanan* 870 (BM). "Nyasaland", 1919, *Mrs. C. Shinn, s.n.* Lake Shirwa ("Chilwa" plain, alt. 610 m., 9 Sept. 1929, *Burtt Davy* 21913 (IFI) :—vernacular name (Y. & N.) "chikwani".

Southern Rhodesia. Salisbury District : Salisbury, Greenwood Park, 25 Dec. 1937, *G. M. McGregor* M170/37 (IFI). Umtali District : Umtali, alt. 1520–1830 m., Oct. 1927, *Herb. Dept. Agric. S. Rhod.* 1392 :—large forest tree, good timber, Xmas Pass [between Umtali and Penhalonga], *H. Boyd Gilliland* 1248 (IFI) :—plant 5·5–8·5 m. high with a flat crown of leaves and purplish flowers : vernacular name " mnjerenje ". Vumba, at forest edge, alt. 1400 m., 1 Nov. 1946, *Wild* 1596 (S. Rhod. Govt. Herb. No. 16142) :—tree 12 m. high ; flowers white ; stamens red : vernacular name (Manica) " mundjurenje ". Vumba, S.E. slopes, alt. c. 1520 m., 21 Dec. 1946, *N. C. Chase* 68 (S. Rhod. Govt. Herb. No. 11529) :—tree. Melsetter District : Chirinda Outskirts, alt. 1130–1220 m., Sept. 1905, *Swynnerton* 54 bis (K, BM) :—a fair-sized tree with rather smooth bark, straight tall trunk and branching crown ; filaments crimson with white bases, rest of flowers white : vernacular name (Chindao) " mundirenshe ". Trip to Mt. Selinda, Apr. 1939, *G. M. McGregor* M 60/39 (IFI) :—tree to 30 m., in forest, and a pioneer in the natural expansion of the forest.

? Territory. " Rive droit du Zambeze ", *M. Surcouf s.n.*

Madagascar. Nossi-bé : rain-forest of Loko-bé, Sept. 1879, *Hildebrandt* 3123 (K, BM) :—tree. Central Madagascar, *Baron* 988.

The first mention of a plant of the *Acacia gummifera* group is under the vernacular name *Sassa* by Bruce, Travels, **5,** 27 and two plates (1790), and on this plant *Sassa* as described and figured by Bruce both *Sassa gummifera* Gmel. and *Inga sassa* Willd. were based. I have failed to find any trace of actual specimens collected by Bruce, and the above reference is therefore the type of *Albizzia gummifera*. The interpretation is made more difficult by the fact that *Sassa* seems never to have been re-collected in Abyssinia.* In response to an enquiry of mine, Prof. R. Pichi-Sermolli of the Botanical Institute of the University of Florence kindly replied " I am sorry to let you know that no specimen from Abyssinia of *Albizzia gummifera* is present in our Herbarium under this name and its synonyms." However, I consider that it is possible to pin *A. gummifera* down beyond reasonable doubt. Bruce has a rather discursive account of *Sassa*, saying that it grows to " a great height, not inferior to that of an English elm ", and also that " the bark of the tree is thin and of a bluish colour, not unlike that of a cherry-tree when young, or rather whiter." The plates show obviously an *Albizzia* of the *gummifera* group. The rather pointed but obtuse leaflets and the fact that auricles are shown at several places on the anticous side of the leaflets with surprising clearness provide further evidence in favour of the identification of *Sassa* Bruce with the subglabrous smooth-barked tree, rather than with *A. adianthifolia*. We can, I think, leave *A. intermedia* out of consideration here, although it has auriculate leaflets, on the score of its geographical range alone. Although *A. gummifera* has not been refound in Abyssinia, its occurrence there is made yet more probable by the recent discovery of *A. gummifera* at two places in the southern Anglo-Egyptian Sudan.

Typical *A. gummifera*, as recorded above, is in Madagascar ; for comments about the possible presence there of an endemic variety, see under *A. adianthifolia* × *gummifera* on p. 529.

The short bracteoles of *A. gummifera* are distinctive. Very occasionally however they are somewhat larger than usual and exceed the buds at a

*Dr. G. Cufodontis, in Sitzungsber. Oesterr. Akad. Wiss., Math.-Naturw. Kl. **156** (1), 478–9 (1947) described as *Pithecellobium sp.* a plant collected in 1905 by F. J. Bieber in the Kaffa region of Abyssinia. Since writing the present paper, I have seen a later pencilled note in the Kew copy of Dr. Cufodontis' paper, apparently by the author himself, saying that the *Pithecellobium* is *Albizzia gummifera*, a suggestion that seems fully justified by the description and the figure accompanying the record. I have not seen the specimen, which apparently consists of just a leaf, but if the later suggestion is correct then presumably it is the only actual material of *A. gummifera* from Abyssinia in existence.

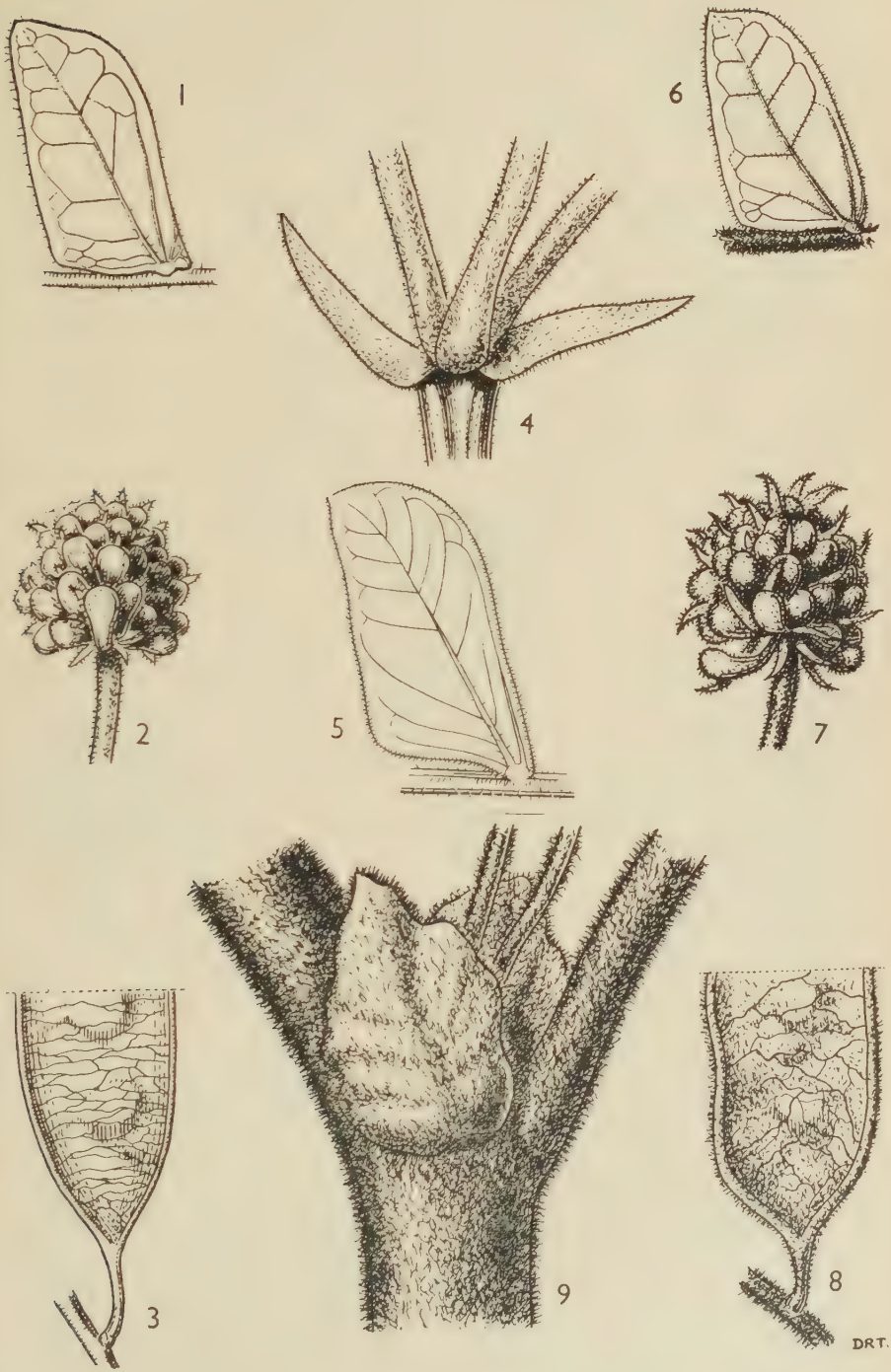

FIG. 2. *Albizzia gummifera* : 1, leaflet, underside, × 2 ; 2, young flower-head, × 4 ; 3, basal portion of pod, × 1 ; 4, stipules, × 4. *A. gummifera* var. *ealaënsis* : 5, leaflet, underside, × 4. *A. adianthifolia* : 6, leaflet, underside, × 2 ; 7, young flower-head, × 4; 8, basal portion of pod, × 1 ; 9, stipules, × 4.

later stage than normal, though even so less than in *A. adianthifolia* ; such bracteoles can be seen in *Mrs. Tweedie* 549 (Kenya), *G. B. Wallace* 428 and *Stolz* 2252 (Tanganyika Territory). I was at first inclined to look on these as possible hybrids with *A. adianthifolia*, but there is no other evidence at all of the latter species, and for the present I prefer to consider them as slight variants of *A. gummifera*.

Albizzia gummifera (Gmel.) C. A. Sm. var. **ealaënsis** (*De Wild.*) *Brenan*, comb. et stat. nov.

Albizzia ealaënsis De Wild. in Ann. Mus. Congo, sér. 5, **2,** 126–7 (1907) ; Bak. f., Leg. Trop. Afr. 869 (1930), sub *A. sassa* [as " *A. ealensis* "] ; Pellegrin, Les Légumineuses du Gabon 15 (1949).

A typo foliolis postice basi omnino exauriculatis, etiamsi in pulvinum minute rotundatis, bracteolis saepe brevioribus 1–2·5 mm. longis differt ; aliter, quoad indumentum, foliola, stipulae, fructus, etc. typica.

Differs from the type by the leaflets being exauriculate at base on the proximal side, although often minutely rounded into the pulvinus, and in the bracteoles often shorter, 1–2·5 mm. long ; otherwise, in indumentum, leaflets, stipules, fruits etc. quite typical.

Nigeria. Calabar Province, Calabar Division : Oban, 1911, *Talbot* 1314 (K, BM) *pro parte* (see also under *A. intermedia*).

French Cameroons. Transition region between the savannah and the rain-forest S. of the R. Sanaga between Jaunde and Dengdeng, not far from the confluence of the Rivers Lom (Sanaga) and Djerem, about 100 km. N.E. of Jaunde, Feb. 1914, *Mildbraed* 8201.

Belgian Congo. District Forestier Central : Eala, 12 May 1905, *Laurent* 665 (BR, typus *A. ealaënsi*) :—stamens red. Same locality, 20 Dec. 1920, *Goossens* (in *Herb. Corbisier*) 1625. Same locality, 1930, *Staner* 1334. Same locality, Oct. 1930, *Staner* 1364 :—vernacular name " djungwamba ". Same locality (cultivated), 1930, *Corbisier* 1589 (K, IFI). Buta, May 1921, *Claessens* 876. Yambao, 25 km. N.W. of Yangambi, 13 Mar. 1937, *Louis* 3586. Yangambi, 1937, *Louis* 3506. Same locality, Sept. 1937, *Louis* 5980. District des Lacs Édouard et Kivu : Between Walikale and Kalehe, Jan. 1932, *Lebrun* 5233.

Uganda. Buganda Province, Mengo District : Mabira Forest, Mar. 1947, *A. W. Kigundu* 54 (ENT) :—tree 12–15 m. high ; bark dark brown, somewhat smooth ; slash hard, yellow with red rings, granular ; crown flat-topped, spreading ; sepals pale green ; petals white ; stamens purple : vernacular name (Luganda) " nongo ".

Tanganyika Territory. Lake Province, Bukoba District : Kaagya, 1935, *H. Gillman* 364 (K, EA) :—dominant tree in dry forest soil.

Angola. Cuanza Norte District : Cazengo, Granja de S. Luiz, 18 Feb. 1910, *Gossweiler* 4612 (BM) :—legumes shedding just now as the tree starts flowering again, and at the same time coming into new leaf ; these fruits are derived from the flowers borne in Sept. last year. Same locality, 20 Feb. 1908, *Gossweiler* 4748 (K, BM) :—tree to 21 m. high, deciduous just before flowering ; flowers white, scented : vernacular name " muanza ".

A. gummifera var. *ealaënsis* is an extremely distinct variety from typical *A. gummifera*, with a different geographical distribution. However, it seems to differ solely by the leaflets lacking auricles and by the rather short bracteoles and I do not therefore consider that it can be separated as a species. From *A. adianthifolia* it is abundantly distinct in all the points (except the auricles) given in the comparative table earlier in this paper. It is most likely to be confused with exauriculate forms of *A. gummifera* × *zygia* : for the differences see under the hybrid. A plant approaching var. *ealaënsis* has been collected in Zanzibar ; see *Vaughan* 47 cited under typical *A. gummifera*.

Albizzia intermedia *De Wild. et Dur.* in Bull. Herb. Boiss., sér. 2, **1**, 751–2 (1901) ; Bak. f., Leg. Trop. Afr. 869 (1930), sub. *A. sassa.*

[*Albizzia gummifera* (non (Gmel.) C. A. Sm.)—Pellegr.,Les Légumineuses du Gabon, 15 (1949), pro parte, quoad spec. *Le Testu* 1988, *Klein* 24.]

Tree with erect trunk and compact crown. *Bark* and size unknown. *Young parts* all densely and shortly ochraceous-brown-pubescent ; young stems not glabrescent, persistently pubescent, remaining brown until ultimately they become coated with grey bark ; lenticels pale, not very numerous or conspicuous. *Stipules* and bracts at base of peduncles oblong-elliptic, about 4·5 mm. long and 2 mm. wide, very early caducous and inconspicuous. *Leaves* with 4–7 pairs of pinnae ; leaflets in 9–12 pairs, the terminal ones rather smaller than the rest, the pinnae thus ± narrowing upwards, only the distal pair of leaflets glandular ; leaflets obliquely rhombic-oblong, obtuse and mucronate at apex, conspicuously auriculate at base on the proximal side, conspicuously discolorous when dry, dark above and very pale beneath, subglabrous above except for a

Fig. 3. *Albizzia intermedia* : 1, base of pod, × 1 ; 2, young head of flowers, × 4 ; 3, leaflet, underside, × 4.

very minute and inconspicuous sparse appressed puberulence, beneath pubescent on midrib and margins, and the whole surface in between clothed with a minute sparse appressed persistent puberulence ; leaflets rather small, about 0·9–1·1 cm. long and 0·4–0·6 cm. wide. *Flowers* capitate. *Bracteoles* very minute and inconspicuous, 0·6–1·5 mm. long, linear-spathulate and falling while the buds are still young. *Calyx* small, 1·5–2 mm. long and about 0·75 mm. in diameter, minutely, shortly and rather densely pubescent, pale yellowish-brown when dry. *Corolla* white, tube 4·5–5·5 mm. long, lobes 0·75–1·2 mm. long and 0·6–1 mm. wide. *Staminal tube* exserted about 1–1·5 cm. beyond corolla, carmine. *Pods* pale brown, minutely and persistently pubescent, not glossy, prominently and mainly transversely venose, 11–17 cm. long, 3·2–3·8 cm. wide.

Nigeria. Calabar Province, Calabar Division : Oban, 1911, *Talbot* 1314 pro parte (see also under *A. gummifera* var. *ealaënsis*).

French Cameroons. Rain-forest area, Jaunde, 1895, *Zenker & Staudt* 250.

Spanish Guinea. Nkolentangan, alt. 450 m., 29 Jun. 1908, *Tessmann* 242 :—flowers yellowish-white.

Gaboon. Cap Esterias, *M. Klein* 24 :—vernacular name " senne ". Tchibanga, 1907–09, *Le Testu* 1988.

Belgian Congo. District du Bas-Congo : Kisantu, *J. Gillet* 1986 (BR, typus *A. intermediae*) :—tall tree.

Angola. Zaire District : Sumba, Peco, alt. 50 m., 16 Jan. 1912, *J. Gossweiler* 8719 (K, BM). Cuanza Sul District : Capir, near the Rivers Carloaongo and Cuvo, alt. 850 m., 22 Jan. 1933, *Gossweiler* 9976 (K, BM). Same locality and altitude, 8 Feb. 1933, *Gossweiler* 10036 (K, BM) :—tree with erect trunk and compact head ; stamens carmine : vernacular name " mugangao ".

A. intermedia has to some extent a combination of characters of both *A. gummifera* and *A. adianthifolia*. At first I was inclined to treat it as a hybrid of these two, but in view of the facts that its area and that of typical *A. gummifera* (whence only *A. intermedia* could have desired its auriculate leaflets) nowhere overlap ; that *A. intermedia* is unknown from East Africa, where typical *A. gummifera* and *A. adianthifolia* meet ; and that certain characters—indumentum and calyx-size—can scarcely be derived from either *A. gummifera* or *A. intermedia* ; I have chosen to maintain *A. intermedia* as a distinct species.

It is a very uniform plant indeed, and in spite of the remarks above there should be no difficulty whatever in separating it from both *A. gummifera* and *A. adianthifolia*. From the former the puberulence on the lower side of the leaflets, the persistently pubescent young shoots not going purplish and the bracteoles should easily separate it ; the short calyx alone will separate *A. intermedia* from the vast majority of specimens of *A. gummifera* and *A. adianthifolia*, but rarely both these latter species may have calyces as small as that of *A. intermedia*. *A. gummifera* var. *ealaënsis* may have the bracteoles as short as those of *A. intermedia*, but is still abundantly distinct in its indumentum and exauriculate leaflets. The colour and the shortness of the indumentum on the young parts of *A. intermedia*, the discolorous leaflets, and the rather broad pale brown pods are also particularly characteristic.

From hybrids between *A. adianthifolia* and *A. gummifera* the calyx- and bracteole-length and the indumentum should readily separate *A. intermedia*.

A specimen from the Belgian Congo in the Kew Herb. (Eala, 1922, *Goossens s.n.*) comes near to *A. intermedia* in the indumentum on the leaflets, but the leaflets are remarkably narrow (1–1·2 cm. long, 3–4 (–5) mm. wide), the bracteoles longer (3 mm.), the calyx longer (3 mm.), and the young parts lack the ochraceous colour of *A. intermedia*. I am unable to match this plant, and mention it in the hope that more material may be collected.

Albizzia adianthifolia (*Schumach.*) *W. F. Wight* in U.S. Dept. Agric. Bur. Pl. Industry, Bull. **137**, 12 (1909).

Mimosa adianthifolia Schumach. in Schumach. et Thonn., Beskriv. Guin. Pl. 322 (1827).

Zygia fastigiata E. Mey., Comm. Pl. Afr. Austr. 165 (1836) ; Benth. in Hook., Lond. Journ. Bot. **3**, 93 (1844) ; Harv. in Harv. et Sond., Fl. Cap. **2**, 285 (1861–2).

Inga fastigiata (E. Mey.) Steud., Nomencl. Bot., ed. 2, 809 (1840).

Albizzia fastigiata (E. Mey.) Oliv., Fl. Trop. Afr. **2**, 361 (1871) ; Benth. in Trans. Linn. Soc. **30**, 570 (1875), pro parte, excl. syn. *Inga sassa* et *Mimosa sassa* ; Hiern, Cat. Afr. Pl. Welw. **1** (**1**), 317 (1896) ; Wood et Evans, Natal Pl. **1**, 24, t. 27 (1898) ; Sim, For. Fl. Cape Good Hope, 213, t. 62 (1907) ; A. Chevalier, Vég. Ut. de l'Afr. Trop. Franç. **5**, 169 (1909) ; Sim, For. Fl. Port. E. Afr. 59, t. 58 (1909) ; Marloth, Fl. S. Afr. **2** (**1**), fig. 30 (p. 50) (1925).

Albizzia fastigiata (E. Mey.) Oliv. var. *chirindensis* Swynn. ex Bak. f. in Journ. Linn. Soc., Bot. **40**, 65 (1911) ; Eyles in Trans. Roy. Soc. S. Afr. **5** (**4**), 361 (1916).

[*Albizzia sassa* (non (Willd.) Chiov.)—Hutch. et Dalz., Fl. W. Trop. Afr. **1**, 362–3, fig. 140 (1928) ; Irvine, Pl. Gold Coast 14 (1930) ; Bak. f., Leg. Trop. Afr. 868–9 (1930), pro parte, excl. syn. *Sassa* et *Mimosa sassa* ; Aubréville, Fl. Forest. Côte d'Ivoire **1**, 174 (1936).]

[*Albizzia gummifera* (non (Gmel.) C. A. Sm.)—C. A. Sm. in Kew Bull. **1930**, 218–9 (1930), pro parte, quoad syn. *Mimosa adianthifolia* [" *adiantifolia* "], *Zygia fastigiata*, *Albizzia fastigiata* ; J. Burtt Davy, Man. Fl. Pl. Transv. **2**, 349 (1932), pro parte, quoad spec. *Drège* et *Legat* 9 ; : J. S. Henkel, Woody Pl. Natal & Zululand, 236–7 (1934) ; Kennedy, Forest Flora S. Nigeria, 115–6 (1936) [some valuable original observations here] ; Hoyle in Check-Lists For. Trees & Shrubs Brit. Emp. **3** (Gold Coast), 72 (1937) ; Brenan in Check-Lists For. Trees & Shrubs Brit. Emp. **5** (Tang. Terr., Pt. 2), 339–40 (1949), pro parte, quoad " Species B " tantum.

Albizzia sassa (Willd.) Chiov. var. *chirindensis* (Swynn. ex Bak. f.) Bak. f., Leg. Trop. Afr. 869 (1930).

Tree, often small or medium and up to 15 m. high, but also large and up to 30 m., with grey to yellowish-brown, rough, fissured or reticulate bark, rarely with smooth bark in east Africa, commonly so in west Africa, and flat crown. *Young stems* densely or very densely and rather coarsely rusty- to fulvous-pubescent, pubescence persistent and stems remaining brown until they become coated with grey bark ; lenticels pale, less conspicuous than in *A. gummifera*. *Stipules* and bracts at base of peduncles ovate, about 5–12 mm. long and 3–6 mm. wide. Leaves with 5–7 pairs of pinnae (rarely only 3 on occasional reduced leaves) ; leaflets in 9–17 pairs, the terminal ones rather smaller than the rest, the pinnae thus ± narrowing upwards, the 1–4 distal pairs glandular ; leaflets obliquely rhombic-quadrate or -oblong, usually obtuse and mucronate at apex, sometimes subacute, proximal margin at base usually ± rounded into the pulvinus but not auriculate, thinly pubescent above, rather plentifully and somewhat appressedly pubescent all over lower surface but especially on midrib and margins, mostly about 0·7–1·7 cm. long and 0·4–0·9 cm. wide. *Flowers* capitate. *Bracteoles* linear-spathulate to oblanceolate, 5–8 mm. long, exceeding the flower-buds, variably persistent but normally more so than in *A. gummifera*. *Calyx* 2·5–4 (rarely only 2) mm. long and about 1 mm. in diameter, with rather denser and longer pubescence than in *A. gummifera* and more deeply toothed. *Corolla* white or greenish-white, tube 4·5–8 mm. long, lobes 1·5–3 mm. long and 0·6–1 mm. wide. *Staminal tube* exserted about 1·3–2 cm. beyond corolla, red to greenish or

pink. *Pods* usually pale brown, ± densely and persistently pubescent, not glossy, prominently venose, 9–19 cm. long, 1·9–3·2 cm. wide.

Senegal. Senegambia, 1839, *Heudelot* 16.

Gambia. Without precise locality, *D. R. Rosevear* 16 (IFI).

Portuguese Guinea. " Bor " [?], 20 June 1930, *Espirito Santo* 6.

French Guinea. Near Daraghé, Samu country, 26 Dec. 1891, *G. F. Scott Elliot* 4303 (K, BM).

Sierra Leone. Northern Province, Kambia District : Kambia, 3 Apr. 1911, *Lane Poole* 9 :—medium-sized tree in rain-forest. Port Loko District : Bunce Island, 26 Mar. 1858, *Kirk* 15. Port Loko, W. block, 13 Aug. 1933, *C. V. Wallace* 121 (IFI) :—tree 11 m. high : vernacular names (T.) " kapun ", " ka-sino ". Karene District : By the R. Sulimania, 24 Mar., *Scott Elliot* 5314 (K, BM) :—tree ; flowers white and crimson. Koniandugu District : Falaba, 17 Mar. 1914, *Aylmer* 14 :—large tree : vernacular name "(M.) bakbwi ". Southern Province, Moyamba District : Bagroo R., 1861, *Mann* 830 :—tree. Njala, 19 Apr. 1928, *Deighton* 1152 (K, BM) :—tree 15 m. high ; flowers pink ; spoons, etc. are made from the soft easily carved wood : vernacular names (Mende) " kpakpei ", (Temne) " kapun ". Pujehun District : Zimi, 6 Mar. 1945, *Deighton* 4096 :—tree 7·5 m.h., in secondary bush. ? Province and District : Kambu Reserve 26 Oct. 1937, *T. E. Edwardson* 187 (IFI) :—tree in farm-bush ; bark exudes red juice ; wood brown : vernacular name " kpakei ". " Sierra Leone, 1828 ", *Wilford s.n.* (BM). Without locality, *Afzelius s.n.* (BM), *C. V. Wallace* 168 (IFI), *G. E. Crichton* 121 (IFI).

Liberia. Monrovia, 1904, *A. Whyte s.n.* Sinoe Basin, 1904, *A. Whyte s.n.*

Ivory Coast. Cercle de l'Indénié : Zaranou, 20–23 Mar. 1907, *Chevalier* 16266 bis. Cercle de L'Agneby : Yapo, in forest in the region of the station, 64 km. from the railway, 18–31 Oct. 1907, *Chevalier* B. 22324. Cercle des Lagunes : Bingerville, 17–20 Feb. 1907, *Chevalier* 16218. Same locality, 14–18 Dec. 1906, *Chevalier* 17307.

Gold Coast. Kumasi District : Kumasi, 1895–6, *H. A. Cummins s.n.* :—tree 15 m. high ; bark grey ; wood hard : vernacular name " assin igan " (?). Same locality, 17 Jan. 1922, *Chipp* 787 :—small tree, very common : vernacular name " prampan ". Same locality, 20 Mar. 1922, *Chipp* 789 :—in deciduous forest, tree to 18 m. high ; bark rough, flaking. Ankobra District : Dunkwa, alt. 120 m., Mar. 1926, *Vigne* 91 IFI :—medium-sized tree : vernacular name (Ash.) " pampina ". Axim District : Near Axim, Mar. 1934, *Irvine* 2386. Tarkwa District : Prestea, June 1923, *G. S. Green* 901 :—vernacular name (Ash.) " pampani ". Birim District : Kwahu, 23 Mar. 1900, *W. H. Johnson* 638 :—huge tree with white fragrant flowers ; anthers red ; base of filaments cohering and forming a tube round style. Kwahu Tafo to Nchinichini ("Nchenechene") at 9 miles, 27 Apr. 1928, *Sir A. E. Kitson* 1071 :—large tree. Akwapim District : S. Scarp Reserve, alt. 520 m., *I. A. Beveridge* 3279 (K, IFI) :—in deciduous forest ; tree 10 m. high ; bark smooth, grey ; leaves bipinnate ; flowers white in heads ; stamens red : vernacular name " okuri ". Without locality, alt. 270 m., Mar. 1936, *Andoh* 4165 (K, IFI, BM) :—tree 10 m. high and 1 m. girth ; yellow-white flowers ; dark pink stamens : vernacular name (Ash.) " pampina ". *A. J. Willis* 26/26 (IFI) :—a large tree, common : vernacular name (Twi, Ash.) " pampina ". ? Gold Coast : Bligusso, Apr. *Thonning s.n.* (typus *A. adianthifoliae*, Herb. Haun.).

Dahomey. Cercle de Porto Novo : Tchoui village (between the lagoon of Porto Novo and the sea), 20 Jan. 1910, *Chevalier* 22787. Without locality, *Consul Burton s.n.*

Nigeria. Niger Province, Bida Division : Agaie, 2 Dec. 1911, *C. C. Yates* 13 :—tree 15–20 m. high, in fringing forest : vernacular name (Nupe) " sankanchi ". Oyo Province, Ibadan Division : Olokemeji Reserve, *A. F. Ross* R. 38 (81 19 7) :—tree up to about 15 m. high, of mixed deciduous and evergreen forest : vernacular name (Yoruba) " ayinre-ogo ". Same locality, *Conservator of Forests* 14 (IFI) :—vernacular name (Yoruba) " ayinre bona bona ". Ibadan, Forest Hill, near Arboretum and by the motor road to Fuel Plantations, in young secondary forest with *Anthocleista*, *Holarrhena*, *Lonchocarpus*, *Millettia*, *Hippocratea* and *Albizzia zygia*, 22 Mar. 1952, *M. C. Ejiofor* FHI 27674 :—tree up to 12 m. high and 0·6 m. girth ; calyx cream, corolla white, stamens and pistil light green in colour ; bole round ; bark brown with grey patches and horizontal markings ; flowers in pickle ; bark thin ; slash with little watery juice slowly oozing out about one hour after the cut is made. Ijebu Province : Shasha Forest Reserve, rain-forest, 15 Mar. 1935, *R. Ross* 93 (BM) :—tree 36 m. high, 1 m. in diameter ; flowers dirty white : vernacular name (Yoruba) " ayinre bonabona ". Benin Province, Benin Division : Okomu Forest Reserve, compartment 86, in high forest with emergents, 3 Feb. 1948, *J. Ebuade* 9124 : –a middle-storey tree 25 m. high, 9 m. to the first branch ; crown rather wide-spreading, 18·6 m. wide ; girth 1·7 m. ; bole fairly straight ; slash : outer bark about 1 mm. thick, brown ; inner bark granular in texture with two distinct zones, one light orange and about 1·5 cm. thick, changing to a light cream, ropy in texture ; sapwood light cream, fairly hard ; a thick whitish exudate

from inner bark after about ten minutes ; petals white ; anthers reddish. Kabba Province, Lokoja Division : Summit of Mt. Patti, 11 Jan. 1906, *W. R. Elliott* 223 :—large tree. ? Lokoja Division : " Confluence " [? of R. Niger & R. Benue], *Barter* 495. Lagos Colony : 2 Apr. 1901, *C. Punch* 128 :—medium sized tree ; burnt by natives for its ash ; timber useless ; exudes an insoluble gum : vernacular name " ayinreta ". Aug. 1901, *Phillips s.n.* :—vernacular name " ayanre ". On the island, Lagos, *Dalziel* 1031. Lagos, *E. W. Foster* 14. Benin Province, Benin Division ? : [Near Sapoba ?], *Kennedy* 1655 (K, IFI, BM). Onitscha Province, Onitscha Division : Onitscha, *A. H. Unwin* 77. Same locality, alt. 80 m., *Conservator of Forests* 75 (IFI). Onitscha, 28 Feb. 1929, *Rosevear* 12/29 (K, IFI). Udi Division : Emene near Enugu, alt. 120 m., Feb. 1926, *Conservator of Forests* 59 (IFI) :—moderate-sized tree in fringing forest. Top of Udi Plateau, alt. 460 m., Mar. 1926, *Conservator of Forests* 55 (IFI) :—moderate-sized tree 19 m. high ; common throughout deciduous fringing forests, encroaches into rain-forest. Owerri Province, Degema Division : 1914, *Mr. & Mrs. Talbot s.n.* 1916, *Mr. & Mrs. Talbot s.n.* (BM). Calabar Province, Itu Division : Aro Chuku, Feb. 1931, *J. Smith* 39 (IFI) :—vernacular name (Benin) " uwowe nabafu ". Without precise locality : Western Lagos, Aug. 1893, *Rowland s.n.* 24 Mar. 1932, *A. F. Ross.* R.134 : vernacular names " ayinre-ogo ", " ayinre-isingede ". Without locality or date, *O.C.* 93 (IFI).

French Cameroons. Bitye, Jaunde, 19..., *Bates* 1372 (BM) :—rather small tree ; corolla white, rose-tinted ; staminal tube brown-red ; vernacular name " ésak ". Transition-region between savannah and rain-forest S. of the Sanaga, between Jaunde and Dengdeng not far from the confluence of the Lom (Sanaga) and Djerem, about 70 km. N.E. of Jaunde, Feb. 1914, *Mildbraed* 8123. Jaunde, alt. 800 m., 1893–4, *Zenker & Staudt* 132 (K, BM). Rain-forest area, Bipinde, 1909, *Zenker* 3871 (K, BM). Same locality, 1912, *Zenker* 4476 (K, IFI, BM).

Belgian Congo. District du Bas-Congo : Mountains at Matadi, 20 Sept. 1932, *Dacremont* 293. District du Kasai (? or Forestier Central) : Lake Leopold II, Bumbuli, Nov. 1932, *Lebrun* 6537. Lake Leopold II, between Kutu and Lukolela, Nov. 1932, *Lebrun* 6695. District Forestier Central : Dundusana, 1913, *Mortehan* 903 (BM). Eala, 12 May 1919, *Vermoesen* 2193 (K, BM, IFI). Wangata near Coquilhatville, Sept. 1930, *Lebrun* 1267. District des Lacs Édouard et Kivu : Between Kasindi and Lubango, W. of Lake Edward, Dec. 1931, *Lebrun* 4670. Lake Kivu, between Walikale and Kalehe, May 1932, *Lebrun* 5339 (K, IFI). District du Haut-Katanga : Near Elisabethville, *Ringoet* 17911 b (BM). Katanga, 10 Oct. 1916, *Ringoet* 70. Arboretum of the Comité Spécial du Katanga, 19 Sept. 1927, *Ritschard* 1484 (BM) :—vernacular name (Kib.) " kapitansofu ".

Uganda. Western Province, Toro District ? : " Kitakwenda, Toro " [I have not succeeded in finding this locality], 4 Aug. 1906, *Bagshawe* 1133 (BM) :—used to make tool-handles ; flowers white : vernacular name " muduku ". Ankole District : Igara country at Kasambia, 27 May 1929, *Snowden* 1364 (K, BM, EA) :—in or near forest and elephant-grass land ; large spreading tree 9–12 m. or more high ; flowers pink ; pods flat ; an useful timber-tree. Rare in savannah between Mbarara and Kagera R., frequent on steep hillsides of Kagera gorge near Kikagati tin-mine, 23 Nov. 1930, *B. D. Burtt* 2894 (K, EA) :—tree 6–9 m. high. Between Nsongezi and Ruborogoto on rocky hillside above Kagera R., alt. 1650 m., *Eggeling* (679) 1053 (K, ENT) :—tree to 6m. high, often umbrella-shaped ; flowers white, staminal tube greenish ; stigmas snow-white ; the common *Albizzia* of E. Ankole : vernacular name (Lunyankole) " mulera." Kalinzu Forest, common tree on fringes, Aug. 1936, *Eggeling* 3205 :—flowers white. Bugamba Forest, 1938, *C. B. Cree* C251 (IFI) :—flowers white or pale pink with yellow staminal tube much exserted. Igara, alt. 1680 m., July 1939, *Purseglove* P.867 :—grassland savannah ; tree 7·5 m. high ; flowers tinged-pink : vernacular name (Lunyankole) " omurira ". Lutoto, alt. 1680 m., 14 Sept. 1941, *A. S. Thomas* Th. 3978 (K, EA) :—in scrub ; occasional tree 10 m. high, flat-topped ; flowers white. Rwoho, E. Ruampara Crown Forest, May 1947, *St. Clair Thompson* 1768 (IFI) :—tree to 7·5 m. high, short-boled, with fire-blackened bark : vernacular name (Lunyankole) " omulera " " mshabeya " (the latter a name for *Albizzia* spp. generally). Rwoho camp, E. Ruampara, alt. 1680 m., Sept. 1947, *M. S. Philip* 10 (ENT) :—tree 6 m. high, in grassland above forest : vernacular name (Lunyankole) " omurera ". Same locality, altitude, date, height and vernacular name, *M. S. Philip* 14 (ENT) :—on edge of forest or on burnt grassy hills ; staminal tube green ; rest of flower white ; very thick bark (2·5 cm.), black on outside close to burning, red-orange ; wood white. Same locality, altitude, date and vernacular name, *M. S. Philip* 27 (ENT) :—on forest edge in grass ; " the largest ' omurera ' I have seen ", 12 m. high and 105 cm. in girth ; bark very thick and rugged, black on outside, red inside to 1·2 cm., and below this with 1·2 cm. of pale orange inner bark ; wood white ; leaves not glossy, pale green ; flowers white with green staminal tube ; fruits light brown and leathery, not papery. Kayonza, on dry unforested ridges, *Sangster* S.331 (K, ENT) :—tree to 4·5 m. high ; bark grey, with regular deep rectangular scorings ; flowers white, sweet-scented. Kigezi District :

Nyakagema, Ruzambwa County, May 1947, *St. Clair Thompson* 1769 (IFI) :—tree 12–15 m. high, in valley forest ; bole short, rather gnarled ; stamens scarlet-tipped. Buganda Province, Masaka District : Hillside, Mulema, Apr. 10, 1903–4, *Bagshawe* 207 (BM) :—wood used for hoe-handles and charcoal ; a flat-topped tree with whitish flowers : vernacular name " munzanchinga ". Hills of Koki and Ankole, alt. 1220–1520 m., 1905, *Dawe* 395 (K, IFI) :—small spreading tree 6 m. high. Koki, Kinoni Hill, alt. 1370 m., Aug. 1947, *Sangster* 946 (ENT) :—in grassland ; tree 6 m. high ; bark grey, very rough and densely scored ; leaflets glaucous ; flowers faintly fragrant ; corolla white ; staminal tube green. Same locality, altitude and date, *Sangster* 947 (ENT) :—as for 946, but staminal tube pink.

Kenya Colony. Coast Province, Kilifi District? : Jimba-Rabai, 1 Mar. 186..., *Rev. W. E. Taylor s.n.* (BM) : vernacular name " mtsami ". Mombasa District : Mainland near Mombasa, Jan. 1876, *Hildebrandt* 1936 (K, BM) :—tree 4 m. high. Mombasa, Nov. 1884, *Rev. T. Wakefield s.n.* Kwale District : Lunguma, *Battiscombe* 34. Shimba, alt. 360 m., 1927, *H. M. Gardner* 1443 (K, IFI, EA) :—medium-sized tree generally found growing on edge of forest or in grassland : vernacular name (Swa.) "mchanimbawa ". Kwale, *R. M. Graham* 312 (K, IFI, BM, EA) :—bark very rough, being split into 1·2 cm. squares ; flowers small, white ; flat-topped tree of bush and savannah ; timber light in colour and much used in Digo Distr. Mafasini, S. Digo, Sept. 1937, *I. R. Dale* 3828 :—fast grower ; tends to be flat-crowned. Shimba Hills, Makadara, alt. 300 m., July 1939, *van Someren* Sh 49 (EA) :—forest and forest patches ; spreading tree up to 9 m. high ; bark grey, smooth : vernacular name (Swa.) " mchammbawa ".*

Tanganyika Territory. Lake Province, ? Ngara District. Bugufi, *H. L. Brett* 3 (EA) :—large, tall tree branching at top, common throughout Bugufi, but large trees are rare : vernacular name (Kirundi) " Msuramvuso ". Bukoba District : Bukoba and Islands, L. Victoria Nyanza, Mar. 1924, *C. L. Bancroft* 183 :—large timber tree : vernacular name (Kihaya) " nyienzenze ". Biharamulo District. Mutala, alt. 1370 m., Apr. 1950, *Gwyn Walkens in Tanganyika Territory Forest Dept. Herb.* 3086 (EA) :—common throughout semi-cultivated lands on heavy soils, and occasional in open deciduous woodland ; roots used for skin-diseases : vernacular name (Zinza) " mseyeya ". Mwanza District : Geita country, Uzinza, alt. 1370 m., 6 June 1937, *B. D. Burtt* 6583 (K, BM) :—scattered in *Brachystegia boehmii–Isoberlinia globiflora* forest ; tree 4·5–7·5 m. high, flat-topped, never a large tree ; bark finely reticulated. Geita, 20 Nov. 1937, *C. L. Bancroft* (24) F.H. 1242 (IFI, EA) :—timber : vernacular name (Kilongo) " mseyeya ". Western Province, Kasulu District ? Mukayagoro to Mugeni, alt. 1350–1500 m., 8 Mar. 1926, *A. Peter* 38441 :—tree 6 m. high, in broad valley-bottom. Northern Province, Moshi District. Moshi, 31 Jan. 1936, *R. M. Davies* 1236 (EA). Tanga Province, Lushoto District : E. Usambaras, Amani, Bomole mountain (locality 0.1.90), summit, alt. 1150 m., 17 Apr. 1914, *A. Peter* K 46 :—tree. Monga, mountain grassland (locality 0.1.92), alt. 1100 m., 19 Apr. 1914, *A. Peter* K 48 :—tree ; bipinnate leaves. Amani, summit of Bomole mountain (locality 0.3.8), alt. 1000 m., 18 Dec. 1914, *A. Peter* K 474 :—tree. Monga, near Sangarawe village (locality 0.3.76), alt. 1000 m., 4 Apr. 1915, *A. Peter* K 498 :—large tree. Forest in grassland near Ngambo (locality 0.3.83), alt. 1180 m., 20 Apr. 1915, *A. Peter* K 501 :—large tree. Magunga to Lutindi mountain (locality 0.3.161), alt. 350 m., *A. Peter* K 523 :—tree with bipinnate leaves. W. Usambaras, Bungu, between the Heputu papyrus-swamp and Geisterwald Gassi (locality 0.4.20), alt. 950 m., 2 Mar. 1916, *A. Peter* K 563 :—8 m. high tree ; flowers white. E. Usambaras, Monga (locality 0.4.71), alt. 1000 m., 10 June 1916, *A. Peter* K 577 :—large tree in forest. Near Maramba (locality 0.4.141), alt. 980 m., 23 Jan. 1917, *A. Peter* K 590. Derema to Longusa (locality 0.4.143), alt. 700 m., 30 Jan. 1917, *A. Peter* K 591 :—tall forest tree. Monga (locality 0.4.154), alt. 1100 m., 16 Feb. 1917, *A. Peter* K 595 :—large forest tree with rough bark. E. Usambaras, Bamba area, below the Ngonya Mountains (locality 0.4.202), alt. 250 m., 22 June 1917, *A. Peter* K 605 :—tree 10 m. high. Amani (locality 0.4.256), alt. 850 m., 8 Jan. 1918, *A. Peter* K 613 :—vernacular names (Bondei) " msayi " (Swa.) " mthai ". Amani, 12 Nov. 1903, *Warnecke* (30) 296 (EA) :—tree. E. Usambaras, Sigi Valley, 8 Mar. 1906, *Zimmermann* 1110 (EA) :—tree. Same locality and date, *Zimmermann* 7017 (EA). Monga, 15 Feb. 1917, *Zimmermann* 7016 (EA). Amani, 15 Mar. 1921, *Soleman* G 5911 (K, IFI, EA). Amani, alt. 900 m., 7 June 1929, *Greenway* 715 (K, IFI, EA) :—tall tree with spreading crown suitable for shade. Amani, alt. 900 m., *Greenway* 3376 (K, IFI, EA) :—common but scattered in native cultivations in evergreen rain-forest zone ; a much branched flat-crowned tree 15 m. high with rough finely fissured yellowish-brown bark, greenish-yellow flowers and flat pods : vernacular name (Kishamb.) " mshai ". Sigi Valley, E. Usambaras, alt. 240 m., 22

*In the East African Herbarium there is the following specimen : Central Province, Kiambu District : Kikuyu Country, alt. 1830–2130 m., *Elliott* 364 :—good white timber : vernacular name (Kik.) " mukuriwa ". This consists of a fruiting piece of *Albizzia maranguënsis* Taub. and a flowering piece of *A. adianthifolia*. This is the only evidence of *A. adianthifolia* inland in Kenya and at such an altitude. I cannot help suspecting some muddle over labelling.

Plate 3

Albizzia adianthifolia in Tanganyika Territory, Iringa District, 17 miles N. of Makumbako. Trunk of rough-barked tree (Greenway & Hoyle 1095).

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Plate 4

Albizzia adianthifolia in Tanganyika Territory, Iringa District, N. of Makumbako. Above : habit of rough-barked tree (Greenway & Hoyle 1095). Below : habit of smooth-barked tree (Greenway & Hoyle 1094).

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May 1933, *Greenway* 3384 (K, IFI, EA) :—growing in abandoned native cultivations, common but scattered throughout the district ; a more or less flat-crowned tree up to 10 m. tall with yellowish-brown roughly fissured corky bark and yellowish-green flowers : vernacular name (Kishamb.) " mshai ". Shume, Lushoto, 7 Nov. 1946, *J. F. Hughes* 3 :—vernacular name (Kishamb.) "mshai". Lushoto District, *H. Gillman* 1002 (K, EA) :—medium-sized tree up to 10 m. high ; good spreading canopy ; foliage retained during dry period Jan. Mar. ; suitable for coffee shade ; flowers Feb.-Mar. ; confined to altitudes 500–1500 m. : vernacular name " mshai mamba ". Eastern Province, Morogoro District : Uluguru Mtns., N.E. side, 22 Oct. 1932, *Schlieben* 2878 (K, BM) :—in bush ; very common tall tree 20–25 m. high ; flowers white. Uzaramo District ? : Sachsenwald, 15 July 1903, *Busse* 3145 BM, EA). Southern Highlands Province, Iringa District : Great North Road, Mbeya-Sao Hill, 17 miles N. of Makumbako (Njombe second turning), 24 July 1949, *Greenway & Hoyle* 1095 (K) :—tree with broad flat *Cedrus*-like crown, very dense ; pods pale green, yellowish towards edges ; old dry pods greyish-brown ; bark rough, " expanded-metal " type, with prominent ridges, mid-grey. Njombe District : Great North Road, Mbeya-Sao Hill, 3 miles N. of Makumbako (Njombe second turning), 24 July 1949, *Greenway & Hoyle* 1094 (K) : tree with broad low umbrella crown, about 6 × 15 m. across crown ; pods on tree pale green, fallen pods pale brown ; bark pale grey, smooth, beech-like ; on pale buff, sandy soil in wind-swept plateau with *Brachystegia spiciformis*, *Apodytes*, *Cassipourea mollis*, *Combretum* sp. (? *splendens*), *Isoberlinia globiflora* etc. etc. Rungwe District : Itifiomakizu [?] 26 Oct. 1911, *Stolz* 949 :—flowers whitish. Mwasukulu, 9 Aug. 1912, *Stolz* 1490. Rungwe, 910–1520 m. alt., 1 Oct. 1932, *R. M. Davies* D 201, D 202, D 203 (K, EA) :—tree with rough bark, fairly common : vernacular name " tangasale ". Bujesa near Mwitika, common, alt. 1370 m., 25 Oct. 1932, *R. M. Davies* D 636 (K, EA) : tree ; vernacular name " mitangasali ". Njombe District : Ruhudje R., Massagati region, N. of river, Ungwe Valley, about 35° 30′E., 25 Nov. 1931, *Schlieben* 1448 (BM) :—tree 15 m. high, isolated. Southern Province, Songea District : Matengo-Songea, alt. 1500 m., 10 Nov., 1936, *F. Zimmer* 148 (BM) :—tall tree 15–20 m. high ; flowers white ; on red-brown soil in open forest. Lindi District : Slope of the Rondo Plateau, 16 May, *Busse* 2600 (EA). Lake Lutamba, about 40 km. W. of Lindi, alt. 200–250 m., *Schlieben* 5244 (BM) :—in open woodland ; flowers white. Newala District. Mahuta, alt. 450 m., 12 Dec. 1942, *Gillman* 1050 (K, EA) :—common tree up to 10 m. high with light spreading canopy, flowering at end of Sept. and standing out above the makome thicket on light yellow sandy loam. Without locality, Jan. 1904, *Zimmermann* 604 (EA) :—tall tree : vernacular name " mshai ". Without locality, *Warnecke* 7018 (EA). " Lake Tanganyika ". alt. 790 m., 16 May 1941, *H. A. Lindeman* 805 (K, EA) :—young tree in old cultivation on hill near lake.

Pemba Island. Sifala, Sept. 1928, *J. H. Vaughan* 381 (BM) :—a tree. Ngezi Forest, 9 Oct. 1929, *Burtt Davy* 22383 (IFI). Jendeli, 19 Feb. 1929, *Greenway* 1494 (K, EA) :—common throughout Pemba in woodlands and open bush formations ; a much branched shrub or tree with spreading branches and flattish crown ; flowers whitish-green. Makongwe Island, 16 Dec. 1930, *Greenway* 2733 (K, EA) : -common in deep soils throughout the island of Pemba and in Zanzibar ; a much branched tree with flattish crown and greenish-white flowers.

Portuguese East Africa. Niassa Province, ? Tungue or Mocimboa da Praia District. Between Mocimboa da Praia and Palma, 15 Sept. 1948, *G. Barbosa* 2139 (EA) :—tree to 8 m. high, on sandy soil : vernacular name " nipevera ". Macondes District : Between Moeda and Nangade, 19 Oct. 1942, *Mendonça* 955 :—tree 10 m. high with spreading crown ; flowers white ; abundant on the slopes of the Ntanga Plateau. From Moeda towards Namana, 12 Sept. 1948, *C. Andrada* 1380 (K, LISC) : -on ash-coloured soil above yellow sand ; in a forest relic with *Chlorophora excelsa*, *Parinari ? curatellifolia* etc. ; tree 8–12 m. high : vernacular name (E.) " nipovéria ". Between Moeda and Chomba, 25 Sept. 1948, *G. Barbosa* 2244 (EA) :—tree 8 m. high : vernacular name " nipavera ". Montipuez District : Balama, 31 Aug. 1948, *C. Andrada* 1310 (LISC) :—on ash-coloured soil, sandy or not ; mixed degraded forest ; tree 15–20 m. high with white flowers : vernacular names (N.) " nipovera ", (E.) " mepupè ", (Meto) " nadji ". Same locality and date, *G. Barbosa* 1946 (LISC, EA) :—tree 20 m. high ; bark scored with a subquadrangular network ; petals white. Zambézia Province, Quelimane District : Between Quelimane and Gurué, 13 Sept. 1941, *Torre* 3437 (K, LISC) : -tree 6–8 m. high with broad crown, scattered in the forest. Between Nicuadala and Maganja da Costa, 31 July 1943, *Torre* 5734 (LISC) :—tree 8–15 m. high : vernacular name " murranga ". Near Nhamarroi, 12 June 1943, *Torre* 5785 :—tree 8–15 m. high with broad crown ; frequent in *Brachystegia-Isoberlinia* woodland. Lugela, Munguluni Mission, Nov. 1946, *Mrs. Webster* 131 (Kew) :—a forest tree. Manica e Sofala Province, Cherimgoma District : Mzimbili, Aug. 1911, *Dawe* 398. Chimoio District : Mavita, bank of R. Manica, 25 Apr. 1948, *G. Barbosa* 1567 (LISC) :—tree 10 m. high. Moribane District : Near Inhaminga, 27 May 1948, *Mendonça* 4392 (K, LISC) :—tree 10–12 m. high ; bark finely rugose : vernacular name " tanga-tanga ". Mossurize District : Mafuci-Mossurize, alt. 910 m., Aug. 1907, *W. H. Johnson* 272 :—large tree producing a

fruity-smelling gum ; heartwood bright yellow. Sul do Save Province, Massinga District : Near Massinga, alt. 110 m., Sept. 1937, *Gomes e Sousa* 2039 :—very common tree 7–10 m. high with white flowers, on dry and sandy-argillaceous soils. Morumbene District : Inhamussua near Inhambane, *Gomes e Sousa* 1666 (K, EA) :—tree 6–8 m. high in dry forest ; flowers white. Near Morumbene, Oct. 1937, *Gomes e Sousa* 2060 :—tall tree 10–12 m. high, not common ; flowers with stamens red above. Homoine District : Homoine, near Inhanombe R., Oct. 1939, *Gomes e Sousa* 2243 :—tree 6–8 m. high, common in open forest, with very aromatic white flowers. Panda District : Jacobécua, alt. 150 m., Aug. 1937, *Gomes e Sousa* 1965 :—tree 10 m. high ; flowers white ; in xerophilous forest on sandy dry soil. Lourenço Marques Province : Delagoa Bay, Aug. 1876, *Monteiro* 33 :—tree with yellowish-white flowers. Delagoa Bay, alt. 50 m., 28 Sept. 1908, *Swynnerton* 6230 (BM) :—very common as a low, flat-crowned tree in open bush, now leafing out well and in full flower ; flowers greenish-white, scented, and particularly attractive to various lepidoptera ; the flower-heads have each a central floret shorter and stouter than the rest with down-turned stamens free at the level of the corolla-tube ; in some there are 3 or 4 or even more such flowers ; some of them show a transition to the ordinary form ; bark nearly smooth, though when slightly rough it shows vertical lines. Lourenço Marques, 25 Oct. 1919, *Shantz* 329 :—large spreading tree 6 m. high. Lourenço Marques, scrub, 3 Oct. 1925, *C. E. Moss & A. M. Ottley* 11848 (BM). Between Lourenço Marques and Marracuene, 9 Oct. 1940, *Torre* 1736 (LISC) :—tree 6–8 m. high, abundant in dry forest. Between Manhica and Vila João Belo, 9 Dec. 1940, *Torre* 2263 (LISC) :—tree 5–7 m. high with white flowers, in dense forest. Maputo region, Santaca, 90 km. S. of Lourenço Marques, 23 Sept. 1947, *Gomes e Sousa* 3616 :—flat-topped tree 10–12 m. high with white flowers, common in open forest on sandy soil. Maputo region, Santaca, 31 July 1948, *Gomes e Sousa* 3768 :—a tree 6–8 m. high with white flowers, common in open forest and old cultivations : vernacular name " goane ".

Nyasaland. Dowa District : Dowa, alt. 1370 m., 28 Oct. 1941, *Greenway* 6369 (K, EA) :—locally common but scattered in secondary *Erythrina-Cussonia-Ficus-Acacia woodii* woodland broken by native cultivations on a dark reddish-brown loam ; a much branched flat-crowned tree up to 12 m. high with very spreading branches, very rough finely reticulate bark, greenish-white petals and crimson stamens ; exudes a soft dark reddish-brown gum. Fort Manning District : Fort Manning, Likasu Estate, 2 Sept. 1929, *Burtt Davy* 21064 (IFI) :—vernacular name " mseenje ". Mlanje District : Sayama Estate [on or near Mlanje Mountain], 22 Sept. 1929, *Burtt Davy* 21975 (IFI) :—vernacular name (Yao) " chikwani ". Cholo District : Cholo Mtn., alt. 1100 m., *L. J. Brass* 17859 :—plentiful in rain-forests ; tree 20–30 cm. high and up to 75 cm. diam. ; flowers white : vernacular name " tanga-tanga ". Without locality, *J. E. A. Carver* 6 (IFI).

S. Rhodesia. Zimbabwe District : Zimbabwe, by stream, alt. 1070 m., 4 Oct. 1949, *Wild* 2991 (S. Rhod. G.H. 25188) :—flat-topped tree 10·5 m. high ; flowers white ; staminal tube greenish. Melsetter District : Chirinda outskirts, alt. 1130–1220 m., Sept. 1905, *Swynnerton* 52 (isotypus *A. fastigiatae* var. *chirindensis*) :—a smallish tree with dark rough bark ; flowers white (including stigmas etc.) ; filaments green : vernacular name (Chindao) " munjerenshe ". Without precise locality, Sept.–Oct. 1912, *Swynnerton s.n.* (BM).

N. Rhodesia. Kasama District : Between Issoka and Kasama near Malole, alt. 1520 m., 4 Oct. 1936, *B. D. Burtt* 6172 (K, BM) :—with *Vellozia splendens* on great bare rock-slope in *Brachystegia*-clothed shallow valley, local ; small tree 2–4 m. high. Luwingu District : Luwingu boma, 19 May 1931, *D. Stevenson* 250/31 (K, IFI). ? Fort Rosebery or Luwingu District : Kawendimusi, Bangweolo, 1911, *R. E. Fries* 809. Mwinilunga District : Mwinilunga, alt. about 1370 m., Sept. 1934, *Trapnell* 1601 :—in clearings on loamy margin of Kalahari Sand ; small tree 9 m. high with markedly flat crown : vernacular name (Chilunda) " kabanzabanza ". Evergreen vegetation by R. Matonchi, below garden, 12 Feb. 1938, *Milne-Redhead* 4542 :—tree 10 m. high with flat crown ; leaflets deep green above, paler beneath ; rhachis yellowish-brown : vernacular name (Chilunda) " kabanzabanza ". Ndola District : Itawa R., 28 Dec. 1932, *C. E. Duff* 66 (K, IFI) :—vernacular name (W.) " mutanga ". Ndola boma, Sept. 1933, *C. E. Duff* 162/33 (K, IFI). Mumbwa District : Namwala road from Mumbwa, alt. 1100 m., 22 June 1932, *Trapnell* 2071 :—in dense bush on quartzitic sandy soil ; leaflets coriaceous, deep glossy green above ; a flat-crowned tree 9–12 m. high.

Angola. Zaire District : Nioxe-Luruluge, alt. 100 m., 7 Mar., *Gossweiler* 8789 (K, BM). " lala " [? Tala], found along streams near the Congo, 1921, *Dawe* 1 :—vernacular name " luange ". Congo District : Common on plateau-lands, Damba, Nkusu and Zombo, 1921, *Dawe* 161 :—vernacular name (Kongo) " mulu ". Cuanza Norte District : Common in the more upland forests of the central and western Serra de Alta Queta, June 1856 ; Zengas, 18 Sept. 1856, *Welwitsch* 1769 (same number for both localities) (K, BM) :—tree 6–9 m. high with fastigiate branches, umbrella-shaped crown and whitish flowers. On wooded declivities near Canguerasange, at Arimo do Senr.

Mariano, Dec. 1854, Aug., Sept. 1856, *Welwitsch* 1769b (K, BM) :—tree 6–7·5 m. high with dichotomous fastigiate branches, upper ones and branchlets horizontal ; crown umbrella-shaped ; corolla white ; stamens of radial flowers green, of central white. A common tree, Granja de S. Luiz, Cazengo, 1909, *Gossweiler* 4686 (K, BM) : Same locality, flowers May–Sept., fruit Aug. 1909, *Gossweiler* 4786 (K, BM) :—trunk 3 m. high and 0·4 m. in diameter ; crown broadly and horizontally spreading ; flowers white. Same locality, Apr. 1908, *Gossweiler* 4836 (BM) : —evergreen tree to 12 m. ; crown broad, much branched ; flowers white. Same locality, May 1912, *Gossweiler* 5631 (BM) :—deciduous tree with broad crown, common near the residency. Camondai, 25 Oct. 1911, *Gossweiler* 5127 (BM) :—small tree 9 m. high with broad crown : vernacular name " muanza ". Same locality and date, *Gossweiler* 5128 (BM) :—tree 12 m. high, with broad crown : vernacular name " camuanza ". Same locality, 31 May 1912, *Gossweiler* 5609 (BM) :—a deciduous tree. Malange District : Near the Mission Station, Malange, July 1903, *Gossweiler* 1325 (BM). In thickets at Kamasaia, near Malange, Aug., *Gossweiler* 1344 (BM) :—flowers white, strongly sweet-scented : vernacular name " dianze ". Not abundant in mixed forests at N'Bango, 4 June 1903, *Gossweiler* 1363 (K, BM) :—a tree some 12 m. high with erect trunk and broad crown resembling *Albizzia welwitschii* ; leaflets glossy above, quite coriaceous ; legumes " transparent " [*sic*, but not so], with flat roundish seeds : vernacular names "quiduenza" " muzemba ". On the road to Quisal, beyond the Catholic Mission Station, 15 Aug. 1903, *Gossweiler* 1366 (K, BM) :—a beautiful tree with regularly formed trunk 0·5 m. in diameter ; crown broad ; branches spreading ; flowers white ; in mixed forests with " N'Gumbo ", " N-Gungo " and several *Combreta*. In the Bango forests near Malange, accompanied by " N'fungo ", " N'jumbo " and several *Combreta* as well as *Cleistanthus*, 17 Aug. 1903, *Gossweiler* 1368 (BM) :—tree no more than 9 m. high ; trunk about 75 cm. in diameter, some 4·5 m. high, obliquely ascending ; crown very broad, branches spreading and casting a dense shade upon a big area of ground below, densely leafy at flowering time ; flowers white, very sweetly scented : vernacular name " dianze ". Common in mixed secondary thickets, Bango, Aug., *Gossweiler* 1391 (BM). Road to Prototypo*, 31 Aug. 1911, *Gossweiler* 5060 (BM) :—tree 21 m. high ; flowers sweetly scented. Savannah in the Quela highlands, *Baroness Nolde* 506 (BM). Lunda District : Between Dundo and Camissombo, 25 July 1927, *Carrisso & Mendonça* 177 (BM) :—in open xerophilous forest. Saurimo, xerophilous forest, 1 Sept. 1927, *Carrisso & Mendonça* 425 (BM). Savannah, not frequent at Dundo, June 1948, *Gossweiler* 14203 :— tree 4–7 m. high with broad crown. Moxico District : Teixeira de Souza, alt. 1100 m., 10 July 1940, *Gossweiler* 12343 (BM) :—evergreen tree 10 m. high, in durisilva, sporadic and very scattered but not frequent.

Transvaal. Zoutpansberg, Shewass Bush, alt. about 970–1100 m., Sept. 1908, *C. E. Legat* 4867 :—" flat-crowned *Albizzia* ".

Zululand. Ngoya Forest, *E. A. Schmidt* 1445 (IFI). St. Lucia Bay, 5 Aug. 1934, *Pole Evans* 3646 [probably, but specimen bad]. Without precise locality, *Gerrard* 271 (BM).

Natal. Inanda District : "Port Natal" (i.e. Durban), *Drège s.n.* (isosyntypus *Zygiae fastigiatae*). Port Natal, 1840, *Krauss* 300 (K, BM). Inanda, May-June 1880, *J. M. Wood* 765. Near Durban, Oct. 1888, *Wilms* 1969. Durban, *Rehmann* 8677 (BM) " In silvis Berea " [Durban], alt. 50 m., 5 Oct. 1896, *Medley Wood* 6135 (BM) : – " fl. coloris melini ". Umzinyati Falls, 23 Sept. 1937, *McClean & Ogilvie* 28868. Umzinto District : Dumisa, Friedenau Farm, alt. 600 m., 29 Aug. 1909, *Rudatis* 681 (K, BM) :—tree 15 m. high, in forests on stony slopes.

Pondoland. " St. Johns " [probably Port St. Johns], 24 May 1918, *A. O. Mogg* 18216.

Albizzia adianthifolia, the most widespread of the three species in the *A. gummifera* complex, is readily distinguished from the other two by the leaflets not being auricled on the proximal side at base ; the margin here may indeed sometimes be rather abruptly rounded into the pulvinus, but there is never the prominent flat-based auricle of *A. gummifera*, sens. strict., and *A. intermedia*. The broad stipules, long bracteoles (but see note under *A. gummifera* on pp. 516-8) and coarse rusty indumentum of *A. adianthifolia* are also very characteristic, and the determination of herbarium-specimens will very rarely be troublesome. These latter characters will readily distinguish *A. adianthifolia* from the exauriculate var. *ealaënsis* of *A. gummifera*. In the field in east Africa the thick rough grey to dark bark

*Mr. A. W. Exell kindly tells me that Prototypo is " almost without doubt in the Cazengo Forest in Cuanza Norte . . . ."

normally contrasts strongly with the thin smooth grey to whitish bark of *A. gummifera*. This however while usual is not always so. Messrs. Greenway & Hoyle have collected a most interesting pair of specimens in Tanganyika by the Great North Road (Nos. 1094, 1095) which in vegetative characters are both *A. adianthifolia*, one of which has the normal rough bark, the other smooth beech-like bark. There is here no possibility of mixed specimens. Except for the smooth bark in 1094 there is no evidence whatever of hybridity with *A. gummifera* and I am sure that it must be accepted as only a variant of *A. adianthifolia*. Mr. R. W. J. Keay tells me that in Nigeria the bark of *A. adianthifolia* is normally smooth. Additional evidence of this is given by *Beveridge* 3279 (Gold Coast where he notes the bark as smooth. Mr. P. C. Lancaster, Silviculturist, Forest Research Branch, Forest Department, Ibadan, Nigeria, sends in a letter to Mr. R. W. J. Keay a description of the bark of *Albizzia adianthifolia* : " Greyish-brown in colour. Generally smooth but in places with very small fissures running up and down about 3 mm. apart and 1–1½ cm. long and sometimes slight horizontal ridges. Young saplings have very distinct lines running up and down the stem."

These remarks must not detract from the usefulness of the bark-characters in the majority of trees of these two species. See also the notes on *Swynnerton* 6230 from Portuguese East Africa, where incidentally there are interesting observations on the curious central floret of each capitulum, whose presence and differentiation seems to be characteristic of the whole *A. gummifera* complex. A note on *Dale* 3828 suggests that *A. adianthifolia* is a fast grower and flat-crowned while *A. gummifera* is a slow grower and more bushy.

A. adianthifolia, though varying somewhat in size of leaves and hairiness, is, considering its vast range, a constant and easily recognised plant. In *A. gummifera* the stamen-filaments appear always to be deep red ; judging from collector's notes those of *A. adianthifolia* vary from red to pink or green. *Sangster* 946 and 947, both collected on Kinoni Hill in Uganda, were said to differ only by the green or pink staminal tubes. It is likely that this will be an useful field-character for distinguishing *A. adianthifolia* and *A. gummifera*, especially in view of the frequency with which green tubes have been noted in East Africa ; but I still feel that more careful observation is wanted of the living plants. Dr. H. Wild informs me that in his experience in S. Rhodesia green tubes are constant in *A. adianthifolia*.

I feel sure that people will feel tempted to spell the specific name as " *adiantifolia* ", but although to modern eyes " *adianthifolia* " looks odd it must not be altered. Schumacher seems to have used this spelling deliberately, and there is no reason to suspect a spelling-mistake. The genus *Adiantum* L. was spelt " *Adianthum* " by various early authors, see Pfeiffer, Nomenclator Botanicus **1**, 56 (1873).

HYBRIDS

Albizzia adianthifolia (*Schumach.*) *W. F. Wight* × **gummifera** (*Gmel.*) *C. A. Sm.*, hybr. nov.?

A *A. adianthifolia* foliolis ± auriculatis subtus tenuiter puberulis, stipulis bracteisque angustis, bracteolis brevibus differt.

A *A. gummifera* foliolis nonnunquam minus auriculatis subtus ± puberulis distat.

A *A. intermedia* indumento bracteolis calycibusque longioribus valde distincta.

The hybrid differs from *A. adianthifolia* in the ± auriculate leaflets thinly and less conspicuously puberulous beneath, in the narrow stipules and bracts, and in the short bracteoles ; from *A. gummifera* in the leaflets being ± puberulous on the surface beneath, and sometimes less auriculate; and from *A. intermedia* in the indumentum and in the longer bracteoles and calyces.

Belgian Congo. District des Lacs Édouard et Kivu : Tshumba, 1934, *G. de Witte* 1634.

Portuguese East Africa. Niassa Province : 10 km. N. of Nametil, Sept. 1941, *A. Gomes e Sousa* 2271 (typus hybridae, K) :—tree with reddish-coloured flowers, flattened top, 10 m. high ; in open forest on formerly cultivated sandy-argillaceous soils.

Nyasaland. Mlanje District : Mount Mlanje, alt. 1830 m., *A. Whyte s.n.* (BM).

Gomes e Sousa 2271 and *Whyte s.n.* are the more convincing specimens, with some of the leaflets auriculate and some not, and having a thin inconspicuous puberulence all over the lower surface. The Whyte specimen has in addition bracts up to 3 mm. wide, the bracteoles exceeding buds, and hairiness of young shoots like that of *A. adianthifolia*. *de Witte* 1634 is very near *A. gummifera*, but differs in the hairier rhachides of leaves and pinnae, in having some sparse hairs on the lower surface of the leaflets, and in having longer bracteoles. This last character alone I do not consider indicative of hybridity (see note made under *A. gummifera* on pp. 516-8).

There are certain specimens from Madagascar that will key down to this hybrid, viz. :—

Forests of East Betsileo, *Baron* 221. Central Madagascar, *Baron* 1936 (K, BM), 3762. Analamazaotra, 1919, *Thouvenot* 114 (K, BM). Without precise locality, *Goudot s.n.* (BM), *I. O. Thompson s.n.* (BM).

These are very near *A. gummifera*, but differ principally in having a rather sparse but long pubescence on the lower surface of the leaflets, and in having the rhachides of the leaves and pinnae more pubescent. From *A. adianthifolia* they are distinct in the auriculate leaflets, stipules, bracts, bracteoles, etc. Morphologically they suggest a hybrid of the two, but so far *A. adianthifolia* is unrecorded for Madagascar, though it may well occur there. I think it very possible that these Madagascar specimens of *A. gummifera* represent an endemic pubescent variety of *A. gummifera*, but the material is sparse, and there are no pods. I think it therefore wiser to wait before making a decision about them.

Albizzia adianthifolia (*Schumach.*) *W. F. Wight* × **zygia** (*DC.*) *Macbr.*, hybr. nov. ?

A *A. adianthifolia* foliolis paucioribus (3–9-jugis) subtus inter costam marginesque sparsissime pubescentibus, terminalibus ± majoribus hinc pinnis superne ± dilatatis, bracteolis alabastra haud vel vix superantibus differt.

A *A. zygia* pinnis numerosioribus (4–5 nec 1–3 (–4)), foliolis numerosioribus subtus inter costam marginesque sparsissime pubescentibus, bracteis stipulisque multo latioribus (2–3 mm. latis) differt.

This hybrid differs from *A. adianthifolia* in the fewer leaflets in 8–9 pairs very sparingly pubescent on the lower surface between the midrib and margins, the terminal leaflets ± larger than the rest, the pinnae thus ± enlarging upwards, and in the bracteoles not or hardly longer than the buds ; from *A. zygia* in the more numerous pinnae (4–5 pairs, not 1–3 (–4)), the more numerous leaflets sparsely pubescent on the lower surface between the midrib and margins, and in the much broader bracts and stipules 2–3 mm. wide.

Gold Coast. Without precise locality, Mar. 1926, *Vigne* 77 (typus hybridae, K) :—medium tree : vernacular name " campina ".

This is a distinct and convincing hybrid, apparently only once collected.

Albizzia grandibracteata *Taub.* × **gummifera** *(Gmel.) C. A. Sm.*, hybr. nov. ?

A *A. grandibracteata* stipulis bracteisque saepe angustioribus, pinnis saepe pluribus (2–5- nec 1–3-jugis), foliolis saepe numerosioribus (6–10-jugis nec 3–6-jugis) basi postice sollemniter ± plane auriculatis differt.

A *A. gummifera* stipulis bracteisque latis, pinnis 2–5- nec (3–) 5–7-jugis, foliolis paucioribus subtus inter costam et margines sparse pubescentibus terminalibus ± majoribus hinc pinnis superne ± dilatatis differt.

The hybrid differs from *A. grandibracteata* in the often narrower stipules and bracts, the pinnae often more numerous (2–5 pairs as against 1–3), the more numerous leaflets (6–10 as against 3–6 pairs) usually ± clearly auriculate at base on the posticous side ; from *A. gummifera* in the broad stipules and bracts, the pinnae in 2–5 pairs (as against (3–) 5–7), the fewer leaflets sparsely pubescent beneath on surface between midrib and margins, the terminal ones rather larger than the rest, the pinnae thus ± widening upwards.

Belgian Congo. District des Lacs Édouard et Kivu : Between Kisenji and Sake, at Kesheru, 12 Jan. 1931, *B. D. Burtt* 3268 :—tree to 12 m. high ; flowers with pink central tube ; common in young forest. Between Kasindi and Lubango, Ituri, Jan. 1932, *Lebrun* 4722.

Anglo-Egyptian Sudan. Equatoria Province : Near rest-house, Mt. Baghanj, Imatong Mtns., alt. 1830–2130 m., 13 June 1939, *Andrews* A 1911 :—medium tree with smooth bark, abundant : vernacular name (Latuka) " Lari ".

Uganda. Northern Province, West Nile District : Zeio, Mar. 1935, *Eggeling* E. 1906 (BM) :—in riverside strips ; tree 6 m. high, ± flat-topped ; pinnae 3–4 pairs ; leaflets 6–9 pairs ; bracts fairly large ; calyx long ; flowers red and white. Acholi District : S.E. Imatongs, Lomwaga Mtn., alt. 1980 m., 4 Apr. 1945, *Greenway & F. C. Hummel* 7271 (K, IFI, ENT, EA) :—locally dominant with *Rauvolfia* and *Maba abyssinica* in fringing forest in *Combretum collinum*, *Protea*, *Psorospermum*, *Gymnosporia senegalensis* open bushland on a gentle mountain slope ; a flat-crowned tree up to 18 m. high with smooth grey bark ; flowers in globular heads with white corollas and long-exserted bundles of red stamens ; pods up to 20 cm. long, papery and glabrous. Western Province, Bunyoro District : Near Budongo Forest edge, June 1932, *N. Y. Brasnett* 842 (typus hybridae, K) : —vernacular name (Lunyoro) " murongo "—this name is apparently given to the species when seen growing outside the forest and not much more than a bush as a result of annual fires. Ankole District. Common codominant in Bugamba Forest, 1938, *C. S. Cree* C 217 (IFI) :—12 m.h. ; bark smooth, light coloured. East Ruampara, Nov. 1946, *Sangster* 887 b (IFI) :—tree 12 m. high. Rwoho camp, E. Ruampara Crown Forest, alt. 1680 m., Sept. 1947, *M. S. Philip* 26 (ENT) :—with *Catha edulis* ; tree 9 m. high and 15 cm. in diameter ; leaves larger than any other specimen, fewer leaflets per pinna, with distal leaflets obviously larger than proximal ; flowers with staminal tube white or at most stamens pink beyond point of junction with tube ; no fruits ever on ground. Buganda Province, Masaka District : Kabula, near the border of Ankole District, alt. 1430 m., Oct. 1932, *W. J. Eggeling* (690) 1064 :—tree to 6 m. high ; flowers pink.

This hybrid between *A. gummifera* and *A. grandibracteata* is a very convincing one, showing characters derived from both parents. It has only been found where the areas of the two parent species overlap. Although (see *Greenway & Hummel* 7271, above) neither of the parents has been so far recorded from the Uganda side of the Imatong Mts., *A. gummifera* has been collected on the Sudan side, and *A. grandibracteata* extends as far N. as the Anglo-Egyptian Sudan.

Eggeling 1906 is very unusual in being a convincing hybrid much on the *grandibracteata* side. The bracts and stipules are 4–8 mm. wide ; the leaflets are 7–9 pairs in the upper pinnae, very thinly hairy beneath between the mid-rib and margins, the uppermost pair acute. It differs from the other specimens of *A. gummifera* × *grandibracteata* in having some of the leaflets slightly auriculed at base but mostly not. The lack of auricles is, I consider, a character of *A. grandibracteata* and not of *A. adianthifolia*, for which there seems no other evidence, and which is unknown anywhere in northern Uganda.

Mr. H. C. Dawkins in E. Afr. Agric. Journ. **17,** 99 (1951) makes the very interesting remark that in Mengo District of Uganda " there are so many intermediates between the above two species [*A. grandibracteata* and *A. gummifera*] that without the inflorescences it is often impossible to decide to which a specimen tends, much less belongs."

Albizzia gummifera (*Gmel.*) *C. A. Sm.* × **zygia** (*DC.*) *Macbr.*, hybr. nov. ?

[*Albizzia welwitschii* (non Oliv.)—Oliv. in Fl. Trop. Afr. **2**, 262–3 (1871), pro parte, quoad spec. *Mann* 939.]

Albizzia oliveri Pellegr., Légum. Gabon 14 (1949), gallice tantum descripta.

A *A. gummifera* pinnis saepe paucioribus 3–6-jugis superne ± dilatatis, foliolis plerumque paucioribus 6 -9-jugis basi exauriculatis terminalibus quam alia ± majoribus differt.

A *A. zygia* pinnis foliolisque plerumque numerosioribus distinguenda.

The hybrid differs from *A. gummifera* in the often fewer pinnae (3 -6 pairs) ± widened towards apex, in the normally fewer leaflets in 6 -9 pairs, exauriculate at the base, the terminal ones ± larger than the others ; from *A. zygia* in the normally more numerous pinnae and leaflets.

Ubangi-Shari. Ubangi : Wakia region, *Tisserant* 2052 [probably, but specimen very scrappy].

Gaboon. Gaboon R., July 1861, *Mann* 939 (typus *A. oliveri*, K) :—tree. Without precise locality, *Klaine* 440.

Belgian Congo. District du Haut-Katanga ? : Munama, Rosenhof, 8 Oct. 1928, *Quarré* 1314.

Uganda. Buganda Province, Masaka District : Bugala Island, Sese, alt. 1190 m., Nov. 1931, *Eggeling* (81) 254 (K, ENT) :—small tree to 6 m. high (4 seen, only one of which was in flower) ; flowers white with red staminal tube : vernacular name (Luganda) " nongo ".

Angola. Cuanza Sul District : Capir, near the Rivers Carloaongo and Cuvo, alt. 850 m., 20 Jan. 1933, *Gossweiler* 10007 (K, BM).

Most of the specimens of this hybrid are convincing. It differs from *A. intermedia* ? × *zygia* in the non-auriculate leaflets, but in very little else. From *A. grandibracteata* × *zygia* it is more clearly distinct in the narrower

bracts and stipules, the leaflets glabrous beneath except on midrib and margins, and in the very short indumentum of the inflorescence.

Mann 939 (Gaboon) was the second element included by Oliver in his *A. welwitschii* ; the first was the type (*Welwitsch s.n.*) ; the third—a description and plate (under the name *Zygia brownei* Walp., i.e. *Albizzia zygia* (DC.) Macbr.) in Schweinfurth, Reliq. Kotschyanae, 10–11, t.10 (1868), was based on a plant collected by Cienkowski in the Anglo-Egyptian Sudan. This is very probably *A. gummifera* × *zygia*, although the hybrid has not been found otherwise in the Sudan. *A. grandibracteata* × *gummifera* has, but Schweinfurth's mention of " foliis glaberrimis " suggests *zygia* rather than *grandibracteata* as a parent of Cienkowski's plant.

I have taken the *gummifera* parentage here in a wide sense. It will be obvious that, at any rate in the Gaboon and Angolan specimens, from geography alone typical *gummifera* can hardly be a parent. This, together with the non-auriculate leaflets, suggests that in some at least, and perhaps all of the *gummifera* × *zygia* specimens, it is *gummifera* var. *ealaënsis* and not typical *gummifera* that is involved. Also it is probable that the habitat of *zygia* is likely to be more similar to that of var. *ealaënsis* than of typical *gummifera* (see under Geographical Distribution, ahead .

Albizzia? **intermedia** *De Wild. et Dur.* × **zygia** (*DC.*) *Macbr.*, hybr. nov.?

Albizzia welwitschii Oliv., Fl. Trop. Afr. **2**, 262–3 (1871) (sens. strict., pro parte, quoad spec. angol. leg. *Welwitsch* ; Hiern, Cat. Afr. Pl. Welw. **1** (**1**), 317 (1896).

Feuilleea welwitschii (Oliv.) O. Ktze., Rev. Gen. **1**, 189 (1891).

A *A. intermedia* foliolis paucioribus 5–7-jugis majoribus (plerumque 1–1·8 cm. latis) subtus costa marginibusque exceptis glabris, distalibus quam proximales majoribus hinc pinnis superne dilatatis, partibus juvenilibus haud ochraceo-pubescentibus, ramulis mox atropurpureis differt.

A *A. zygia* pinnis plerumque 4-jugis foliolis 5–7-jugis basi postice auriculatis distat.

The hybrid differs from *A. intermedia* in the fewer leaflets in 5–7 pairs, larger (normally 1–1·8 cm. wide), glabrous beneath except on the midrib and margins, the distal leaflets larger than the proximal, the pinnae thus being ± widened above, in the young parts not being ochraceous-pubescent, the young branchlets soon becoming dark purplish; from *A. zygia* in the pinnae being mostly 4-paired, the leaflets in 5–7 pairs, auriculate at base on the posticous side.

Angola. Cuanza Norte District : Golungo Alto, *Welwitsch s.n.* (" 1770. 1772·1773 "*) (typus *A. welwitschii*, K). Very frequent in mountainous forests of the whole district of Golungo Alto : Arimo do Senr. Mariano near Canguerasange, fls. Oct., frt. Nov. 1854, *Welwitsch* 1770 (BM) :—tall tree with broad crown truncate at apex ; wood very durable ; flowers greenish-yellow ; I have seen trees 24 m. and more, but they

*This is due to some silly muddled system of numbering whereby various Welwitsch numbers were amalgamated at Kew, apparently by Oliver. *Welwitsch* 1772 and 1773 at the British Museum (Natural History) are nothing to do with our plant, which is apparently equal to *Welwitsch* 1770 (about Bumba and Sange). Incidentally, another sheet of *Welwitsch* 1770 at the British Museum lacks auricles, and is probably *A. zygia*.

are usually only 4·5–12 m. high ; distinguishable from afar by the shape of the crown. In forest about Bumba and Sange, Nov. 1854, *Welwitsch* 1770 (BM) :—tree 6–9 m. high, with spreading, ascending-fastigiate branches ; flowers whitish-straw-coloured. Pungo Andongo, Dec. 1856, *Welwitsch* 1771 (BM) :—tree 6 m. high, with broad crown ; distal leaflets larger ; flowers whitish ; sporadic in small open rocky woods to the north of the fortress. Dalatando-Cazengo, Coffee Experimental Station, alt. 730 m., June 1935, *Gossweiler* 10201 (BM). Malange District : Quela highlands, alt. 1200 m., in rain forest, Sept. 1938, *Baroness Nolde* 842 (BM).

The interpretation of this plant is very difficult, and I feel most uncertain about it. The evidence for *A. zygia* seems clear, but the auricled leaflets are perplexing. Morphologically it looks like a cross between *A. gummifera*, sens. strict., and *A. zygia*, but *A. gummifera*, sens. strict., has not been recorded for Angola, or anywhere near. The only plant of the *gummifera* complex with auricles that has been recorded from this region is *A. intermedia* and I have therefore queried *A. welwitschii* as *intermedia* × *zygia*. I am bound, however, to admit that the evidence for *intermedia*, is, apart from the auricles, far from convincing, and the identity of *A. welwitschii* must depend on further field-investigation.

I consider that *Welwitsch s.n.* in the Kew Herbarium should be the lectotype of *A. welwitschii*. For the other elements included by Oliver under *A. welwitschii*, see the preceding hybrid.

GEOGRAPHICAL DISTRIBUTION

We now probably have enough information to see clearly the general outline of the pattern of distribution followed by the three species of *Albizzia* that we have been discussing. There remain, no doubt, many details to be filled in by future observation and collecting, but what facts we have I think justify some discussion, especially as the areas of very, very few African species have been adequately mapped.

A. gummifera sens. strict. has its main centre in east Africa, from the Anglo-Egyptian Sudan in the north to S. Rhodesia and Portuguese East Africa in the south, and from the coast of the Indian Ocean in the east to the mountainous region round Lakes Kivu and Edward in the west. As we have seen the only present evidence of its occurrence in Abyssinia is Bruce's *Sassa*, but I have no doubt that it does really occur there. In general it grows at fairly high altitudes, about 1200–2440 m., although it does occasionally occur lower, as at Turiani in Tanganyika, and even almost at sea-level on Mafia Island ; in mentioning Mafia Island we must remember that an endemic species of the typically montane Ericaceous genus *Philippia* (*P. mafiensis* Engl.) also occurs there. It is too normally a plant of evergreen forest, probably always ± secondary, or else of vegetation very recently derived from it. It appears to demand a high rainfall and to be unable to withstand a severe dry season. I suspect that high humidity during the dry season may explain its occurrence at low elevations. It is indicative of some connection between the floras that *A. gummifera* in its typical form occurs also in Madagascar. The areas of many species of montane forest in east Africa run north and south, and I feel certain that many will be found to conform, more or less, to that of *A. gummifera*. There are other clear affinities between the floras of east Africa and Madagascar among other plants and also birds. For an interesting discussion of the latter see Moreau in Proc. Zool. Soc. Lond. **121**, 897 (1952).

The most interesting thing about the distribution of *A. gummifera* is that, while in east Africa its area is consistent, some thousands of miles to the west it turns up, quite typically, in the highlands of Bamenda in the British Cameroons. Enough collecting has been done in the intervening areas to make it almost certain that we are dealing with a genuinely bi-centric area, and that the two component parts will not be joined up as a result of future collecting. In having this very remarkable distribution *A. gummifera* does not stand alone. It is now beyond doubt that certain areas in west Africa produce species that are otherwise typically east African. To list these species completely would be out of place here, but some examples may be interesting. They are all more or less widespread in east Africa, and I have therefore only given their localities in the west.

FIG. 4. Distribution of *Albizzia gummifera*, its var. *ealaënsis* and *A. intermedia*.

This list, I must emphasise, is merely a selection, and it would be very easy indeed to lengthen it :—

Cissus crotalarioides Planch. (*Ampelidaceae*) (Nupe, Bauchi Plateau, Buar).

Trifolium usambarense Taub. (*Leguminosae*) (Bamenda, Fernando Po).

Indigofera emarginella Steud. (*Leguminosae*) (Bauchi Plateau, Buar, Ubangi).

Crassula alba Forsk. (*C. mannii* Hook. f.) (*Crassulaceae*) (Cameroon Mountain, Fernando Po).

Crassula alsinoides (Hook. f.) Engl. (*Crassulaceae*) (Bamenda, Cameroon Mountain, Fernando Po).

Antherotoma naudini Hook. f. (*Melastomataceae*) (Sierra Leone, Bauchi Plateau, Bamenda). Incidentally, this species, like *Albizzia gummifera*, occurs also in Madagascar.

Caucalis melanantha (Hochst.) Benth. et Hook. f. (*Umbelliferae*) (Bamenda, Cameroon Mountain, Fernando Po).

Vernonia auriculifera Hiern (*V. uniflora* Hutch. et Dalz.) (Compositae) (Bamenda).

Helichrysum fruticosum (Forsk.) Vatke (*Compositae*) (Bamenda, Cameroon Mountain, Fernando Po).

Crassocephalum mannii (Hook. f.) Milne-Redhead (*Senecio multicorymbosus* Klatt) (*Compositae*) (Bamenda, Cameroon Mountain, Fernando Po).

Agauria salicifolia (Comm. ex Lam.) Hook. f. ex Oliv. var. *pyrifolia* Pers.) Oliv. (*Ericaceae*) (Bamenda, Cameroon Mountain, Fernando Po).

Discopodium penniverium Hochst. (*Solanaceae*) (Cameroon Mountain, Fernando Po).

Calamintha "*simensis* (Hochst.) Benth." * (*Labiatae*) (Cameroon Mountain, Fernando Po).

Xymalos monospora (Harv.) Baill. (*Monimiaceae*) (Bamenda, Fernando Po).

Faurea speciosa Welw. (*Proteaceae*) (Bauchi Plateau, Buar?).

Of the above localities, Nupe and the Bauchi Plateau are in Nigeria, Bamenda and the Cameroon Mountain in the British Cameroons, and Buar is in the French Cameroons. For further discussion of the vegetation and flora of the Bauchi Plateau and the Cameroon Mountain, see Keay, An Outline of Nigerian Vegetation, pp. 26–7, 31–3 respectively (1949). For ornithological parallels see Moreau in Proc. Zool. Soc. Lond. **121**, 893 (1952).

The species involved include some typical of savannah, others of forest, and their intentional introduction in the west is quite out of the question ; likewise I feel that their recent immigration, with the present climate and topography, is impossible ; I believe that their west African localities are relics of a formerly wider and more continuous area. The way in which these localities are linked, also the absence of any local genetic differences in the species, are in my view indications of recent connection, although the places are often separated by hundreds of miles of lowland in which these species could now hardly occur. The fact that the species are not even varietally distinct from those of east Africa again indicates recent connection in that direction. This raises the further questions of when, and by what route? Until more is known of the climatic history of tropical Africa it is going to be very difficult even to guess an answer to the first question, but again and again the botanist studying the flora of tropical Africa comes against evidence pointing to major climatic changes in relatively recent times, and I feel convinced that we must look to this for our explanation of the present distribution of *Albizzia gummifera*. It is just as difficult to guess at the route. Perhaps when the Ubangi-Shari region, which is still botanically little known, and occupies a geographically crucial position, is better explored, more definite evidence of extension of floras across Africa may be found, but at the moment it is difficult to do more than speculate and gather facts.

Albizzia gummifera var. *ealaënsis* differs from *A. gummifera* itself both in its area and, apparently, in its ecology. It extends from Nigeria, the

*An account of the involved taxonomy of this plant is awaiting publication elsewhere.

French Cameroons and Angola in the west across the Congo to Uganda and Tanganyika. Although the areas of *A. gummifera* and var. *ealaënsis* overlap in the east, the latter only occurs in areas whose flora is well-known to have close affinities with that of west Africa, and the overlapping is probably more apparent than real. The var. *ealaënsis* appears typically to be a plant of the evergreen rain-forest of west and central Africa, and not to be at all a plant of montane forest as typical *A. gummifera* is. It looks as though both geographical and ecological isolation have combined to keep var. *ealaënsis* separate, and it might be possible to make a case for maintaining *ealaënsis* as a species.

A. intermedia, like *A. gummifera* var. *ealaënsis*, is a plant of the evergreen rain-forest of west Africa, but as can be seen from the map, its area is a markedly different one—a rather narrow strip along the coast from Oban in south-eastern Nigeria to Angola in the south. It is likely that a number of species that occur in the Cameroons and Gaboon but not in main Congo forests will follow this pattern, but it is difficult at present to point our parallels. *Haumania danckelmaniana* (J. Braun et K. Schum.) Milne-Redhead, which occurs at Barombi in the British Cameroons, and then in various localities in the French Cameroons and Spanish Guinea, going as far S. as Sibange in the Gaboon, is a likely member of this group, though *Albizzia intermedia* goes further N. and S.

A. adianthifolia is by far the most widespread of the species, with a really vast area from the Gambia to Kenya and southwards to Angola and Pondoland. It might be thought that *A. adianthifolia* covers the same area as *A. gummifera*, and a great deal more. This, however, is not entirely true. In east Africa *A. adianthifolia* is not recorded N. of the Equator, while *A. gummifera* extends to the southern Anglo-Egyptian Sudan. In Kenya there is a most remarkable and interesting contrast in distribution. *A. gummifera* is a common plant of the Kenya Highlands, but quite unknown from the coastal belt ; while *A. adianthifolia* is quite unkown from the Highlands (but see footnote on p. 524), and is confined to a small area near the coast at the extreme southern end of the colony. I cannot help feeling that the absence of *A. adianthifolia* from most of Kenya must be due to some historical reason.

Unlike *A. gummifera*, *A. adianthifolia* is apparently absent from Madagascar, although it is possible that further collecting may reveal it there. Southwards, *A. adianthifolia* extends far beyond the Tropic into Natal and Pondoland. A distribution which again is shared by various other tropical species and genera, e.g. *Cola*, *Drypetes*, *Kiggelaria africana* L., *Rapanea*, to mention only a few. The extra-tropical area of *A. adianthifolia* corresponds rather closely to the Eastern Coast Region described by Dr. Hutchinson in his account of the floral regions of South Africa (see A Botanist in Southern Africa, 552–3 : 1946) ; he writes of this Region : " This narrow belt may be regarded as almost entirely of tropical African origin, being an extension of the flora of the East African coast belt."

There are decided indications that *A. adianthifolia* and *A. gummifera* are ecologically different. As we have already said, *A. gummifera* is normally a plant of evergreen forest at fairly high altitudes. The highest elevation that I have for *A. adianthifolia* is 1680 m. in Uganda (cf. 2440 m. for *A. gummifera*, but see footnote on p. 524) and over much of its area *A. adianthifolia* is a typically lowland species. Thus, although their

ranges of elevation overlap, there seems nevertheless to be a marked distinction here. Also, as is clear from its area, *A. adianthifolia* has a wide range of tolerance as far as climate is concerned, and may occur in places with a relatively severe dry season with low humidity. Its habitat ranges from clearings in evergreen forest to derived grassland and " miombo " woodland.

It does not seem likely that *A. adianthifolia* is fire-tolerant, certainly not in West Africa, according to Mr. R. W. J. Keay's observations. It is just possible that it may sometimes be so in East Africa. The rough bark of *A. adianthifolia* has been repeatedly stressed, although not constant ; *Philip* 14 and 27 (Uganda) describe it as thick-up to about 2·5 cm. Both *Philip* 14 and *St. Clair Thompson* 1768 (Uganda) describe it as fire-blackened, suggesting at least a possible tolerance of fire. There seems, unfortunately, to be no direct information on this.

FIG. 5. Distribution of *Albizzia adianthifolia*. Note : the encircled triangle in Kenya refers to the specimen *Elliott* 364—see footnote on p. 524.

Philip 12, 15 and 18 (Uganda) describe the bark of *A. gummifera* as " very thin " (apparently less than 5 mm.), and it is highly unlikely that so thin a bark will have any resistance to fire.

Mr. H. C. Dawkins, of whom I enquired about the variation of bark in species of the *Albizzia gummifera* group in Uganda, kindly wrote in reply : " I believe that *A. gummifera*, *grandibracteata*, *adianthifolia* and *zygia* have rough and smooth barked forms according to community and due possibly to bark exposure to light. They occur in forest-edge, termite-mound, *Hyparrhenia* and other burned localities, as well as in closed high forest, and I can definitely vouch for this type of thing in *A. gummifera*, *grandibracteata*, and *zygia*, but I have no evidence of thin-barked *adianthifolia* in East Africa."

Flora of the Anglo-Egyptian Sudan, Vol. II.*—The speed and energy with which Dr. F. W. Andrews has surmounted the formidable task of writing a flora of this important region of tropical Africa will be evident when we recall that his first volume appeared as recently as 1950. It was reviewed on pages 40–41 of the Kew Bulletin for 1951.

The second volume, comprising the families, by Hutchinson's system, from *Sterculiaceae* to *Dipsacaceae*, follows closely the methods of the first, embodying their undoubted merits and also I am afraid the various lacks and inconveniences pointed out by the reviewer of that volume. One additional criticism may be made of the way the book is set out : room might surely be found in the page-headings to mention the genus starting each page, to avoid, especially in large genera, having to turn back in order to find out the name of the genus being dealt with. Various new combinations and at least one new name, a separate list of which would have been helpful, affect plants occurring over a considerable portion of tropical Africa. We shall await with interest the third and concluding volume of a flora which, though far from faultless, must be indispensable in the Sudan, and whose usefulness is appreciated elsewhere.

J. P. M. Brenan.

*The Flowering Plants of the Anglo-Egyptian Sudan, Vol. 2. By Dr. F. W. Andrews. Buncle & Co. Ltd., Arbroath, Scotland. 1952. Price 21/-.

The botanist in a tropical forest.—Considerable areas of South America are still unexplored botanically and in many others only superficial field work has been carried out. The present book* is an account by Dr. W. R. Philipson of a collecting expedition to territories in Columbia between the Andes and the Amazon, undertaken at the invitation of the Colombian Minister of Health. The main object of the expedition was to visit the Macarena Mountains to study their sandstone flora. It would appear that the plants collected, or at any rate most of them, had not been worked out when the book was written and from the botanical point of view this detracts from its value. Some of Dr. Philipson's descriptions of life in the tropical South American forest are vivid and some of the photographs of dense vegetation are impressive. Dr. Philipson is to be congratulated on reaching to the summit of the Macarena Mountains, after many adventures and disappointments. Some floristic connections between these sandstone mountains and others far distant in British Guiana and Venezuela are noted. One has, however, to await the publication of a complete enumeration of the collection before judging the full phytogeographical value of these (and other) links. One hopes that such an enumeration and a discussion of the importance of Dr. Philipson's discoveries will not be too long delayed.

W. B. Turrill.

*The Immaculate Forest, by Dr. W. R. Philipson, Messrs. Hutchinson & Co., pp. 223, plates of photographs, 1952, 18/-d.

CHROMOSOME NUMBERS IN SPECIES OF LONICERA.

E. K. Janaki Ammal, D.Sc. and Barbara Saunders.

There are about 400 known species of the family Caprifoliaceae and of these 180 belong to the genus Lonicera. The genus has a distinctly northern distribution, extending from Quebec and Alaska to Mexico in America, and in the Old World from North Europe and Siberia to the mountains of North Africa, Java and the Philippines (Fig. 1).

The region of greatest specific density is the Himalayas and China, where two-thirds of the species have their home. Only nineteen species are found in Europe and some of these also extend into Asia. There are three species in Britain, *L. caprifolium*, *L. periclymenum* and *L. xylosteum*.

One hundred species are known in horticulture, and many varieties and hybrids have arisen in cultivation. We have examined fifty species grown in the Royal Botanic Gardens, Kew, and the R.H.S. Gardens Wisley, as well as twenty two garden varieties and hybrids.

DISTRIBUTION OF THE GENUS LONICERA
Fig. 1

The chromosome numbers of the species studied have been presented in tabular form based on the classification adopted by Rehder in his *Manual of Cultivated Shrubs and Tress*, second edition, 1940.

Vilmorin and Simonet in 1927, Sax and Kribs in 1930, Matsuura and Sato in 1935 and Sugiura in 1936 have published chromosome numbers of various species of Lonicera. In every instance the basic number was $x=9$ (see *Chromosome Atlas of Cultivated Plants* by C. D. Darlington and E. K. Janaki Ammal).

Polyploidy occurs in four of the five sections of the genus. We found only nine tetraploids. Four species had both diploid and tetraploid forms and in three of these—*L. myrtillus*, *L. thibetica* and *L. coerulea*—the tetraploids are more alpine in their distribution than the diploids. The

distribution of diploid and tetraploid forms of *L. periclymenum*, the common Woodbine of Britain, needs further investigation. Plants growing in Surrey were tetraploids.

There are only three hexaploid Honeysuckles ; the evergreen *L. henryi* and its larger-flowered variety *coriacea* and *L. tragophylla*. These species are distributed in that part of south-east Asia which includes part of Assam, south-east Tibet, Upper Burma, west Szechuan and Yunnan (see Fig. 2), a region characterized by the occurrence of high polyploidy in several other genera of Asian plants. (See map in *Rhododendron Year Book*, 1950).

Sub-genus 1. *CHAMAECERASUS*

Section 1. Isoxylosteum, $x=9$

	2*n*	DISTRIBUTION		2*n*	DISTRIBUTION
L. rupicola	18	Himalayas	*L. myrtillus*	18	Afgh. Himalaya
L. syringantha	18	N.W. China	var. *depressa*	36	Alpine Himalaya
L. tomentella	18	Sikkim	*L. thibetica*	18-36	Tibet, W. Szechuan

Section 2. Isika, $x=9$

L. altmanni	18	Turkestan	var. *longifolia*	18	Kamchatka ?
L. canadensis	18	Quebec—Minn.	*L. pileata*	18	C. and W. China
L. chaetocarpa	18	W. China	*L. pyrenaica*	18	Pyrenees, Balearic Is.
L. discolor	18	Kashmir, Afgh.			
L. fragrantissima	18	E. China	*L. standishii*	18	China
L. hispida var. *bracteata*	18	Himalayas, Tibet	*L. tenuipes*	18	Japan
L. involucrata	18	Quebec to Alaska, Rockies to Mexico	*L. vesicaria*	18	Korea
			L. coerulea	18, 36	N. and C. Europe, N. Asia, Japan
var. *humilus*	18	Colorado			
L. ledebourii	18	California	*L. alpigena*	36	Mountains of C. and S. Europe
L. maximowiczii	18	Manchuria, Korea			
L. nervosa	18	N.W. China	*L. glehnii*	36	Japan, Saghalin (introduced ?)
L. nitida	18	W. China			
L. orientalis	18	Asia Minor	*L. microphylla*	36	S. W. Kansu, Shansi
var. *caucasica*	18	Transcaucasia, Armenia			

Section 3. Coeloxylosteum, $x=9$

L. chrysantha	18	N.E. Asia, Japan	var. *calvescens*	18	cult.
var. *longipes*	18	Turkestan	*L. tatarica*	18	S. Russia, Altai, Turkestan
L. deflexicalyx	18	W. China, Tibet			
L. koehneana	18	W. China	var. *grandiflora*	18	cult.
L. korolkovii	18	Turkestan	var. *latifolia*	18	cult.
L. maackii	18	Manchuria, Korea	var. *punicea*	18	cult.
			var. *rosea*	18	cult.
var. *erubescens*	18	Manchuria	var. *siberica*	18	cult.
L. morrowii	18	Japan	*L. trichosantha*	18	W. China, Tibet
L. ruprechtiana	18	Manchuria, N. China	*L. xylosteum*	18	Europe to Altai
			var. *mollis*	18	cult.

Section 4. Nintoona, $x=9$

L. biflora	18	S.E. Europe, N. Africa	*L. henryi*	54	Assam, Upper Burma, E. Tibet, W. Hupeh, W. Szechuan
L. japonica	18	E. Asia			
L. alseuosmoides	36	W. China			
var. *coriacea*	54	W. Szechuan			

Sub-genus 2. *PERICLYMENUM* ($x=9$)

	2n			2n	
L. caprifolium	18	Europe, W. Asia	*L. yunnanensis*	18	S.W. China
L. etrusca	18	Mediterranean	*L. periclymenum*	18, 36	Europe, Mediterranean
L. hildebrandtii	18	Burma	var. *belgica*	36	cult.
L. implexa	18	Mediterranean	var. *wisleyensis*	36	Surrey
L. prolifera	18	Ohio-Tenn., Iowa and Wis.	*L. sempervirens*	36	E. and C. U.S.A.
L. splendida	18	Spain			

Hybrids

	2n		2n
× *L. amoena* (*L. tatarica* × *L. korolkowii*)	18	× *L. meundeniensis* (*L. bella* × *L. ruprectiana*)	18
× *L italica* (*L caprifolium* × *L. etrusca*)	18	× *L. tellmanniana* (*L. tragophylla* × *L. sempervirens*)	c.45
× *L. pseudocrysantha* (*L. xylosteum* × *L. chrysantha*)	18		

Fig. 2

The Flora of Angola*.—Workers on the flora of tropical Africa will welcome the publication of the second part of the Conspectus Florae Angolensis to complete the first volume of this excellent work.

Fascicle II contains accounts of the families from *Malvaceae* to *Aquifoliaceae* following Bentham and Hooker's arrangement, a total of 29 families and 112 genera. The account of the *Balsaminaceae*, which is

*L. W. Carrisso, Conspectus Florae Angolensis, vol. 1, fasc. II, by A. W. Exell and F. A. Mendonça, published by Ministério do Ultramar, Junta de Investigações Coloniais, Lisboa, 1951.

Pp. 177–422, plates I–XXI and 1 map. Price 200 $00 (£2 10s.).

being prepared with the help of Dr. G. M. Schulze, will however appear in the next volume.

During the fourteen years which have elasped since the publication of fascicle I, many rich collections have been made in Angola. Whilst it has not been possible to include citations of every specimen additional to the families covered by fascicle I, the present fascicle contains a most useful " Addenda and Conigenda " in which are included species of these families new to the Angolan flora and those specimens which have extended the areas of distribution of already recorded species to districts in which they were not known when the first fascicle was published.

The fascicle also contains a synopsis of the 55 families contained in the first volume, written, as is the rest of the work, in Portuguese, no doubt a most useful addition for those botanists unable to refer to Bentham and Hooker's " Genera Plantarum ".

In spite of many recent changes in the administrative boundaries used in fascicle I, the authors have wisely decided for the purpose of the Conspectus to continue to use the divisions shown in the sketch-map published in 1937. These divisions are shown in greater detail on an excellent folding map printed in colours which accompanies the present fascicle.

An innovation in fascicle II is the inclusion of a number of black and white plates prepared by Miss Marion Rivers-Moore. Some of these depict new or little known species whilst a few, such as tab. XII, show comparative drawings, in this case of leaves and stipules of seven species of *Ochna*, a most useful kind of illustration. Four of the plates relate to species from the first fascicle. The frontispiece is a portrait of Prof. L. W. Carrisso.

Botanists may well be unfamiliar with some of the families found in this work. For instance, the *Linaceae* of Bentham and Hooker, which both Engler and Hutchinson treated as two distinct families, is here represented by six families, namely *Linaceae* (*sensu stricto*), *Hugoniaceae*, *Nectaropetalaceae*, *Ixonanthaceae*, *Ctenolophonaceae* and *Erythroxylaceae* whilst the usually accepted *Simarubaceae* is treated as *Simarubaceae* (*sensu stricto*), *Irvingiaceae*, and *Balanitaceae*. At the generic level the treatment is more orthodox, whilst, wisely in such a work, no attempt has been made to recognize microspecies. Much care has been given to the nomenclature and synonymy, and consequently the Conspectus will be in demand for consultation by workers on the flora of many other parts of Africa.

Printing and production is excellent and printer's errors remarkably few. Conspectus Florae Angolensis is undoubtedly a most important work, the production of further volumes of which is eagerly awaited by those interested in the flora of the African continent. The authors are to be congratulated on the completion, in spite of many difficulties and the interruption caused by the Second World War, of volume I. What better testimony could there be to international co-operation in the field of taxonomic botany? Praise should be given also to foresight of the late Prof. L. W. Carrisso and the authorities in Portugal who have conceived and financed this project, thereby revealing to the world the richness and diversity of the flora of Angola and showing, in no uncertain manner, their willingness to play their part in the production of African regional floras.

E. Milne-Redhead.

REVISION OF THE "FLORA OF WEST TROPICAL AFRICA". —II.

R. W. J. Keay.

ANNONACEAE

Uvaria ovata (*Dunal*) *A. DC.* Mem. Annonac. 29 (1832) ; Oliver in F.T.A. **1** : 21 (1868) ; Engl. et Diels Monogr. Afr. Annonac. 29 (1901) ; Hutch. et Dalz. F.W.T.A. **1** : 50 (1927).

Unona ovata Dunal Monogr. Annonac. 104 (1817) ; DC. Syst. Veg. **1** : 489 (1818) ; DC. Prodr. **1** : 89 (1824).

Uvaria cordata Schum. et Thonn. in Schum. Beskriv. Guin. Pl. 255 (1827) ; Oliver l.c. 22 ; Engl. et Diels l.c. 29 ; Hutch. et Dalz. l.c. 50, excl. descript. et spec. *Farquhar.*

Uvaria globosa Hook. f. in Fl. Nigrit. 210 (1849) ; Oliver l.c. 22 ; Engl. et Diels l.c. 14 ; Hutch. et Dalz. l.c. 50.

Authentic material of *Uvaria ovata* (Dunal) A. DC. and *U. cordata* Schum. & Thonn. does not appear to have been seen for a long time. Engler and Diels in their Monograph (1901) placed these two species in a list of imperfectly known species, at the end of the genus *Uvaria.* Both species are included in the F.T.A. and F.W.T.A., but none of the authors had seen authentic material.

Through the courtesy of Prof. Hagerup of Copenhagen, I have been able to study the specimens of *Uvaria cordata* from Schumacher's herbarium. There are two sheets, both collected by Thonning in Guinea. The two sheets are of one species and may well have been collected from a single plant. Both sheets bear the MS. name *Uvaria ovata.* Dr. J. Gröntved has noted on the specimens that following Schumacher in MS., the name *Uvaria ovata* is equal to *Uvaria cordata* Schum. et Thonn. In response to my enquiry Dr. Gröntved has kindly sent me a copy of Schumacher's MS. notes about these species. It seems clear from this that *Uvaria ovata* and *Uvaria cordata* were regarded by Schumacher as synonyms.

Dunal's publication (1817) of *Unona ovata* refers to De Candolle's description in Systema Vegetabilum which was then *ined.* De Candolle (1818) in describing *Unona ovata* gave the MS. name *Uvaria ovata* Vahl as a synonym. Dunal also refers to this MS. name but quotes it as *Unona ovata.* It is clear therefore that *Unona ovata* Dunal and *Uvaria cordata* Schum. & Thonn., are based on the same gathering by Thonning from what is now the Gold Coast.

The type of *Uvaria globosa* Hook. f. (T. Vogel s.n. from Accra) is undoubtedly identical with Thonning's specimen. *Uvaria globosa* var. *warneckei* Engl. is the same as typical *Uvaria ovata* (Dunal) A. DC.

I have also examined the specimens from Herb. Schumacher which were described in 1827 as *Uvaria cylindrica* Schum. & Thonn. Again there are two precisely similar sheets, collected in Guinea by Thonning. These sheets bear the MS. name *Uvaria macrocarpa,* and are quite clearly authentic material of *Unona macrocarpa* Dunal Monogr. Annonac. 103 (1817), and of DC. Syst. Veg. 1 : 489 (1818), both authors quoting the MS. name of *Uvaria macrocarpa* attributed to Vahl. Dr. Gröntved has

also sent me a copy of Schumacher's MS. notes referring to this species, and it is clear from these that Schumacher regarded *Uvaria macrocarpa* and *Uvaria cylindrica* as synonyms. *Unona macrocarpa* Dunal and *Uvaria cylindrica* Schum. & Thonn. have long been recognised as synonyms of *Uvaria chamae* P. Beauv.

It appears therefore that when Schumacher described these two species in the genus *Uvaria* he deliberately chose epithets different from those which were in MS. on the sheets and which had already been validated in the genus *Unona* by Dunal. I am most grateful to Prof. Hagerup and Dr. Gröntved for their assistance in clearing up this problem.

De Candolle described a var. *afzeliana* of *Unona ovata*, based on a specimen in Herb. Lambert collected by Afzelius in Sierra Leone : Dunal referred to this specimen also but did not give it a separate name. An Afzelian specimen in the British Museum agrees with De Candolle's description and appears to be a duplicate of the type of *Unona ovata* Dunal var. *afzeliana* DC. It also agrees with the description of *Uvaria leonensis* Engl. & Diels of which it is in all probability an isotype. I regard this as a subspecies which is recorded from forested hills in Sierra Leone and the Ivory Coast in high rainfall areas. The typical plant has a limited distribution in the coastal thickets of the Gold Coast and Togoland in a relatively dry climate.

The typical plant and subsp. *afzeliana* may be distinguished as follows:—

Leaves oblong-lanceolate, rounded to cordate at the base, midrib beneath densely clothed with long simple or fascicled hairs even at maturity . . . . . *ovata* subsp. *ovata*

Leaves ovate-elliptic, obtuse to cuneate at the base, midrib beneath very sparsely pubescent with short hairs at maturity *ovata* subsp. *afzeliana*

I have seen the following specimens :—

Uvaria ovata (*Dunal*) *A.DC.* subsp. **ovata.**

Gold Coast : without locality *Thonning* s.n. (Schum. Herb., evidently a type of *Unona ovata* Dunal and of *Uvaria cordata* Schum. et Thonn.. Accra *T. Vogel* s.n. (K., holotype of *Uvaria globosa* Hook. f.). Accra, 24 July 1922, *Dalziel* 109 (K.). Achimota Fuel Plantation, 29 Jan. 1948, *Foggie* FH. 5133 (FHO.). Cape Coast, *Brass* s.n. (BM.). Aburi Hills above Dodowa forest, 6 April 1947, *Bally* 67 *a* (K.).

Togoland : Lome, May 1900, *Warnecke* 147 (K., isotype of *Uvaria globosa* Hook. f. var. *warneckei* Engl.).

Uvaria ovata (*Dunal*) *A.DC.* subsp. **afzeliana** (DC.) *Keay* comb. nov.

Unona ovata Dunal var. *afzeliana* DC. Syst. Veg. **1** : 489 (1918) ; DC. Prodr. **1** : 89 (1824).

Uvaria leonensis Engl. et Diels in Notizbl. Bot. Gart. Berl. **2** : 293 (1899).

Sierra Leone : without locality, *Afzelius* s.n. (B.M., evidently a type of *Unona ovata* DC. var. *afzeliana* DC. and of *Uvaria leonensis* Engl. et Diels). On rocks near top of Sugar Loaf, 26 April 1892, *Sc. Elliot* 5774 (K.). Rowala, 23 July 1914, *Thomas* 1056 (K.).

Liberia : Kolahun District, on rock outcrop near Soplima, 1 Nov. 1947, *Baldwin* 10053 (K.).

Ivory Coast : summit of Mt. Goula, near Danané, 10 April 1909, *Chevalier* 21210 (K.).

MELASTOMATACEAE

Dissotis glauca *Keay* nom. nov.

Dissotis rupicola Hutch. et Dalz. F.W.T.A. **1** : 211 (1927) et in Kew Bull. **1928** : 221 (1928), non *D. rupicola* Gilg ex Engl. Pflanzenw. Afr. **3, 2** : 748 (1921).

Dissotis grandiflora *Sm. ex Benth.* var. **lambii** (*Hutch.*) *Keay* stat. nov.

Dissotis lambii Hutch. in Kew Bull. **1916** : 230 (1916) ; F.W.T.A. **1** : 212 (1927).

This plant is very close to typical *D. grandiflora* and appears to differ only in the less densely setose stems.

Dissotis sessilis *Hutch. ex Brenan et Keay* sp. nov. ; *D. amplexicauli* Jacques-Félix affinis, caulibus pilis plumosis longius pubescentibus nec tomentellis, foliis latioribus amplexicaulibus, calycis tubo dense et brevissime stellato-tomentello differt.

Caulis erectus, lignosus, praeter inflorescentiam simplex, 60–120 cm. altus, usque ad 6 mm. diametro ; internodia plerumque 0·7–1·5 cm. longa, saepe prope basim caulis et inflorescentiae longiora et ibi usque ad 2–3 cm. longa ; indumentum caulis pilis plumosis pallide brunneis patentibus circiter 0·5 mm. longis necnon aliis stellatis brevissimis saepe occultis breviter sed densissime tomentosum, demum inferne glabrescens hinc pilis stellatis magis nudatis. *Folia* sessilia, amplexicaulia, ovata, circiter 1·5–5 cm. longa, 1·2–4 cm. lata, apice acuta vel subacuta, supra dense stellato-tomentella, subtus breviter et densissime plumoso-tomentosa, nervis primariis longitudinalibus 7–9 supra impressis subtus prominentibus, venis transversis supra impressis subtus prominulis. *Paniculae* terminales, anguste pyramidales vel sub-cylindricae, usque circiter 20 cm. longae et 8 (–10) cm. latae, e cymulis 2–5-floribus scorpioideis 1–3 cm. longe pedunculatis compositae. *Bracteae* valde caducae, ovatae, obtusae vel acutae, extra dense stellato-tomentellae, 6–13 mm. longae, 5–10 mm. latae. *Pedicelli* brevissimi, 1–3 mm. longi, more caulium rhachidumque induti. *Calycis tubus* campanulatus vel leviter urceolatus, basi late rotundatus, 5–7 mm. longus, 4–6 mm. latus, extra dense et brevissime stellato-tomentellus pilis plumosis sparse commixtis ; lobi 5, triangulares, 6–8·5 mm. longi, 2–3·25 mm. lati, persistentes, extra densissime tomentelli, intus glabri, purpurei. *Petala* purpurea, late obovata, circiter 2 cm. longa, 1·5 cm. lata, margine glanduloso-ciliolata. *Staminum filamenta* 9 mm. longa, arcuata ; con-

nectivum staminum majorum 1·3 cm. longum, basi in appendiculum 3 mm. longum integrum leviter arcuatum apice capitato-incrassatum productum, connectivum staminum minorum 1 mm. tantum longum, basi in appendiculum quadratum 1 mm. longum 1·5 mm. latum apice leviter emarginatum productum ; antherae staminum majorum 7–9 mm. longae, 1 mm. crassae, antherae staminum minorum 8–9 mm. longae 1 mm. crassae. *Pars libera ovarii* breviter tomentosum, 5-lobatum, setulis absentibus. *Stylus* 2·5 cm. longus, glaber. *Calyx fructifer* subglobosus, usque ad 9 mm. diametro. *Semina* cochlearia, straminea, circiter 1 mm. longa, 0·75 mm. lata, sub lente valido papillis minutissimis in lineis curvatis dispositis ornata.

Sierra Leone : Bintumane Peak, in damp situations, 1720 m. alt., 27 Nov. 1930, *Glanville* 386 (typus in Herb. Kew.) :—1 m. high ; purple flowers. Same locality, common in grassland between 1560 m. and 1720 m. alt., 4 Jan. 1951, *T. S. Jones* 93 (K.). Same locality, in grass field, 1560 m. alt., 4 Jan. 1951, *E. H. Nichols* 9 (K.). Same locality, 1870 m. alt., 9 Jan. 1951, *Glanville* 464 (K.) :—shrubby, flowers cerise. Same locality, damp grassland and swamp on North-east face at 1690 m. alt., 9 Jan. 1951, *T. S. Jones* 80 (K.). Loma Mountains, Nov. 1944, *P. Jaeger* 491 (P.).

Dissotis bamendae *Brenan et Keay* sp. nov. *D. principi* (Bonpl.) Triana peraffinis, caulibus petiolisque hispidis, pilis patentibus simplicibus vel subsimplicibus quam ei *D. principis* longioribus, tubo calycis pilis dimorphis omnibus simplicibus brevioribus vestito differt.

Herba robusta perennis ad 2 m. alta. *Ramuli* juniores plus minusve tetragoni, densissime hispidi pilis patentibus simplicibus vel subsimplicibus, seniores subteretes in longitudinem leviter 6–8– costulati, dense hispidi sed cortice ochraceo inter pilis satis manifesto, demum glabrescentes, internodiis 1·5–5·5 cm. longis ; nodi annulo setarum 3–4 mm. longarum ornati. *Folia* ovato-elliptica vel ovato-lanceolata, circiter 4·5–8 cm. longa, 1·5–3·7 cm. lata, apice acuta, basi rotundata vel subcordata, utrinque pilis longis pagina superiore ad margines adversis et sursum (ad folii apicem) curvatis sed haud appressis dense vestita, margine dentato setis robustis, nervis primariis longitudinalibus 5 supra impressis subtus prominentibus venis transversis inconspicuis conjunctis ; petiolus 8–24 mm. longus, more ramulorum vestitus. *Paniculae* terminales, usque ad 10 cm. longae et 7 cm. latae. *Bracteae* caducae, ovatae vel suborbiculares, 3–5 mm. longae, basi 3–5 mm. latae, marginae ciliatae, extra sparse puberulae, intra glabrae. *Pedicelli* 1·5–3·5 mm. longi, breviter hispidi. *Calycis tubus* oblongo-cylindricus, basi rotundatus, 6·5–8 mm. longus, 4·5–5·5 mm. latus, extra pilis dimorphis omnibus simplicibus vestitus, pilis longioribus 1–2 mm. longis praesertim basim calycis versus densissimis, pilis brevioribus vix 0·5 mm. longis apicem calycis versus inter alias longiores valde manifestis ; lobi 5, ovato-oblongi, 4–5 mm. longi, 2–2·5 mm. lati, apice obtusi vel subacuti,medio puberuli, margine ciliolati, apice setulis brevibus usque ad 0·75 mm. longis, inter anthesin caduci ; lobi totidem squamis angustis circiter 1–1·5 mm. longis apicem versus setulis 1–2 mm. longis ornatis alternantes. *Petala* saturate rosea, late obovato-elliptica, circiter 2·7 cm. longa, circiter 1·8 cm. lata, apice rotundata, margine pilis glandulosis necnon

eglandulosis breviter ciliata. *Staminum filamenta* arcuata, aequilonga, circiter 11–12 mm. longa ; connectivum staminum majorum 2 cm. longum, arcuatum, basi in appendiculum 1 mm. longum bifidum et rectum productum, connectivum staminum minorum 4 mm. longum, basi in appendiculum 0·5 mm. longum bifidum et uncinatum productum; antherae majorae 1 cm. longae 1·5 mm. crassae, minorae 1 cm. longae circiter 1 mm. crassae. *Pars libera ovarii* glabra, superne 5-angulata et circa basin styli corona setularum ornata. *Stylus* 3 cm. longus, arcuatus, glaber, violaceus. *Calyx fructifer* urceolatus, 8–9 mm. longus, 6–7 latus.

British Cameroons : Bamenda Province : above Bamenda, alt. 2200 m., 23 Jan. 1928, *Migeod* 392 (K.) :—herb 1 m. ; flowers violet. Nchan, in grassland, alt. 1560 m., June 1931, *Maitland* 1734 (K.). Mile 8 from Bamenda on the Santa road in shrubby savannah, alt. 1778 m., 2 Jan. 1951, *Keay* FHI. 28344 (typus in Herb. Kew.) :—stout herb to 2 m. high ; flowers deep pink.

French Cameroons : Bambuto, Dec. 1938, *Jacques-Félix* 2657 (K., P.) :—arbrisseau ; fleurs rouges.

Dissotis fruticosa (*Brenan*) *Brenan et Keay* stat. nov.

Dissotis rotundifolia (Sm.) Triana var. *fruticosa* Brenan in Kew Bull. **1950,** 227 (1950).

Affinis *D. rotundifolia* (Sm.) Triana, habitu fruticoso erecto usque ad 1·5 m. alto, foliis lanceolatis vel elliptico-lanceolatis, antheris connectivisque staminum majorum brevioribus, seminibus minute et distincte papillosis nec fovea notatis differt.

Frutex humilis, usque ad 1·5 m. altus, divaricatim ramosus. *Ramuli* juniores rosei, setulis plerumque appressis simplicibus pubescentes, seniores griseo-brunnei, 2·5–5 mm. diametro, persistenter induti. *Folia* inter tempus sitis decidua, lanceolata vel elliptico-lanceolata, 1·5–6·3 cm. longa, 0·5–1·8 cm. lata, apice acuta, basi late cuneata vel rotundata, subtus nervis exceptis albida, utrinque satis dense appresse pilosa, nervis primariis longitudinalibus 3–5 supra leviter impressis subtus prominulis et roseis, venis transversis haud cernendis ; petiolus roseus, 4–20 mm. longus, more ramulorum sed paulo densius vestitus. *Inflorescentiae* terminales vel ramulos abbreviatos terminantes, plerumque uniflorae nonnunquam 2–4- florae. *Bracteae* et bracteolae satis persistentes, ovatae, pubescentes, 1·5–3 mm. longae, 1·25–2 mm. latae ; bracteolae circa medium pedicellorum circiter 2·5–6·5 mm. longorum pubescentiorum insertae. *Flores* matutini. *Calycis tubus* campanulatus, basi rotundatus, 5–7 mm. longus, 3·5–6 mm. latus, extra pilis di-usque octobrachiatis 0·5–1 mm. longe stipitatis laxe vestitus, aliter glaber ; lobi 5, triangulares, 2·5–4 mm. longi, basi 1–2 mm. lati, persistentes, apice setulosi, margine minute ciliolati, aliter glabri. *Petala* pallide rosea, late obovata, circiter 1·3–1·7 cm. longa, 1–1·4 cm. lata, apice rotundata, minute ciliolata. *Staminum filamenta* aequilonga, circiter 5 mm. longa ; connectivum staminum longorum 1·5–2 mm. longum, basi in appendiculum 0·75 mm. longum bifidum et arcuatum productum ; connectivum staminum minorum 0·25 mm. longum basi in appendiculum bifidum circiter 0·5 mm. longum productum ; antherae majorae lilacinae, 4–4·5 mm.

longae, 0·7–0·75 mm. crassae, minorae luteae, 3·75–4 mm. longae, 0·7 mm. crassae. *Pars libera ovarii* setulosa, necnon circa basin styli corona setularum ornata. *Stylus* circiter 8 mm. longus, arcuatus, glaber. *Calyx fructifer* leviter urceolatus, 8–10 mm. longus, 6–7 mm. latus. *Semina* cochlearia, pallide brunnea, circiter 0·75 mm. longa, 0·6 mm. lata, sub lente valido papillis minutissimis in lineis curvatis dispositis ornata.

Nigeria : the following specimens were cited in Kew Bull. **1950** : 227 (1950) :—*Keay* FHI. 22569 (typus speciei in Herb. Kew.), *Keay & Onochie* FHI. 20246, *Keay* FHI. 22583. And the following additional material has since been received : —Idanre Hills, Carter's Peak, at edge of shrubby vegetation with *Hymenodictyon* on granite slabs, 29 Oct. 1949, *Keay* FHI. 25503 :—wide-spreading perennial herb to 50 cm. high ; stems pinkish-crimson ; leaves white below, green above. Idanre Hills, East side of Orosun, at margin of grass-mat on granite rock-face, 30 Oct. 1949, *Keay* FHI. 25512 :—perennial herb with wide shrubby habit, to 75 cm. high ; stems and midribs pink ; leaf-blades white below ; petals pale pink.

Coprinus auricomus Pat. in England.

This attractive member of the plicatilis series was collected for the first time in England amongst grass under trees beside a road at Pickering, Yorkshire on 24th June 1952. From *C. plicatilis* (Curt. ex Fr.) Fr. it differs macroscopically in the pileus not being plicate all the way to the disc and in the gills reaching the stipe. Under the microscope it is at once distinguished by its elliptical, opaque, black spores mostly measuring 11–12 × 6·5–7 μ and especially by the scattered, tapering, thick-walled, golden-brown setae seated amongst the rounded cells of the pileus surface. These setae are up to 200 μ long and resemble those of *Psathyrella subatrata* (Batsch ex Fr.) Gillet but are quite invisible to the naked eye.

Konrad & Maublanc regard *C. hansenii* Lange as a synonym of *C. auricomus* Pat. though Lange did not observe the characteristic setae and destroyed the type collection. If that be correct the species is known from France (Type locality Bois de Vincennes, also near Lyon), Germany, where Ricken identified it erroneously with *Agaricus crenatus* Lasch and from Denmark. It appears to be everywhere rare or is perhaps overlooked owing to its general resemblance to *C. plicatilis*, so that the occurrence of the species in Yorkshire provides an extension of range worth placing on record.

Patouillard's original collection was caespitose on an old stump but Kühner & Josserand, who redescribed the fungus fully in Bull. Soc. Mycol. France Vol. 50 p. 53, 1934, found it in circumstances like those of the Pickering gathering viz : amongst grass or dead leaves in woods and clearings, also on soil in paths and in gardens. Patouillard interpreted the brown erect hairs of the pileus as remnants of a veil and called them an " Ozonium " but his published figures leave little doubt that Kühner & Josserand's interpretation of the species is correct.

R. W. G. Dennis.

A NEW SPECIES OF PUERARIA (LEGUMINOSAE) FROM THAILAND, YIELDING AN OESTROGENIC PRINCIPLE.

M. C. Lakshnakara Kashemsanta, Kasin Suvatabandhu and
H. K. Airy Shaw.

The object of this note is to bring to the attention of botanists an interesting plant which has already for nearly a quarter of a century occupied the attention of medical men and others in Thailand, but which has been the subject of much confusion and uncertainty botanically, and is still without a name. This last desideratum is now supplied.

The following translation (by K.S., edited by H.K.A.S.) is of an article published in a volume entitled *Collected Papers presented at the Science Conference 1949 sponsored by the Science Society of Thailand*, pp. [20–24], figs. (Bangkok, 1950).

Note on Kwao Keur, the Rejuvenating Plant :

by
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About twenty years ago, a tuber, locally known in Chiengmai (Northern Thailand as *kwao keur*, had the reputation of producing a rejuvenating effect on old age. Large quantities of tubers were brought down to Bangkok and were used in the preparation of local medicine by local practitioners. Various brands of medicine, which at that time had no governmental control, were widely sold throughout the country. Enquiries were made and some interesting results are stated to have occurred: one old lady, after taking this medicine regularly, began to menstruate again ; an impotent old man became the father of new offspring ; while one distressing story was that it produced death. When this last news spread, the usual sale of the medicine gradually diminished until now it hardly exists.

Dr. A. F. G. Kerr, then Director of the Botanical Section, in an article entitled " The Reputed Rejuvenator " in the *Journal of the Siam Society, Nat. Hist. Supplement*, **8,** 336-8 (1932), identified the plant as *Butea superba* Roxb., and in the following year Phya Winit wrote on the same subject, in *op. cit.* **9,** 144–7 (1933), still referring to the plant as *Butea superba*, and it is believed that from this journal the subject aroused much interest in various parts of the world.

It is interesting to note that the name *kwao* is commonly applied in Northern Thailand to two species of plant. *Tong kwao*, a tree, is *Butea frondosa*, while *kwao keur* (*keur* means climber) is *Butea superba*. Both plants are common. For this reason, when Dr. A. F. G. Kerr saw the tuber and the leaf specimen of *kwao keur* (for the leaf is somewhat similar to that of *Butea superba*) bearing the same name in the same locality, he had every reason to conclude that they were the same plant.

As time went on, enquiries were sent to the Botanical Section stating that in other countries they could find no tubers from *Butea superba*. This

began another investigation, and it was found that no tubers were found from *Butea superba* in Thailand too. This necessitated furthering the investigation, so the plants known as *kwao*, or *kwao* used in medicine, were sought. Many were brought in : one of them was found to be an aroid, another a *Derris*, *Butea* was eliminated, and perhaps many more. This great variety of specimens probably explains the death cases reported some twenty years ago.

Only just recently, a tuber of *kwao keur* was unexpectedly brought in, and on enquiry it was confirmed that it was the same as that used in large quantity twenty years ago. When the actual plant was shown (June 1946), the leaf was found to be similar to that of *Butea superba*, but no flowers were seen. So the roots were dug up and tubers obtained and sent down for trial in Bangkok, and it was found that the tubers contained some toxic principle, similar to that described by Mr. Suphachai Vanijvatana in an article " A preliminary report on the presence of oestrogenic substance and poisonous substance in the storage root of *Butea superba*," published in the *Thai Science Bulletin*, **4,** 3–9 (1939) ; by Dr. Ouay Ketusinh in his article " A preliminary report on a pharmacologically active principle in *Butea superba*," published in the *Journal of the Medical Association of Thailand*, **24,** 81–82 (1941) ; and by Dr. Dhara Sukhavachana in his article on the Oestrogenic principle of *Butea superba*, in the same volume.

It was not until February 1947 that a flowering specimen was collected. At that time there was no leaf, but later the leaf was collected from the same plant. There is no doubt that from now on the confusing name of *Butea superba* can be dropped, for it is now confirmed that the plant is not *Butea*, and the specimen sent to the Royal Botanic Gardens of Kew for naming has proved to be the new species of *Pueraria* described below.

Pueraria (§**Pueraria**) **mirifica** *Airy Shaw et Suvatabandhu*, sp. nov., *P. Candollei* Grah. affinis, foliolis subtus cinereo-tomentellis, inflorescentiis brevioribus, floribus subduplo minoribus, leguminibus minoribus pubescentibus distincta.

Frutex scandens, usque 5 m. altus vel ultra ; caulis glaber, striatus, 4–7 mm. diametro ; radices tuberosae magnae, globosae vel ellipsoïdeae, usque 15 cm. longae et 6 cm. crassae. *Folia* trifoliolata, tota usque 60 cm. longa. *Petiolus* gracilis, 25–28 cm. longus, 1–2 mm. crassus, supra canaliculatus, minute adpresse puberulus, pulvina basali 8–15 mm. longa usque 4 mm. crassa rugulosa dense puberula. *Rhachis* (inter foliola lateralia et foliolum terminale) 3·5–5·5 cm. longa, 1 mm. crassa. *Stipellae* subulatae, 4–5 mm. longae, vix 1 mm. latae, acutissimae, striatae, adpresse fulvo-pubescentes. *Petioluli* 6–7 mm. longi, 1·5–2 mm. crassi, adpresse fulvo-pubescentes. *Foliola lateralia* obliqua, latere inferiore (postico) late ovata, latere superiore (antico) oblongo-elliptica, 15–18 (–20–25) cm. longa, 12–15 cm. lata, basi altero latere late truncato-rotundata altero latere late cuneato-rotundata, apice brevissime late acuminata acuta ; *foliolum terminale* rhomboïdeo-suborbiculare vel latissime obovatum vel interdum fere subhexagonum, 14–15 cm. diametro, basi late cuneata, apice latissime rotundato et brevissime late acuminato

subacuto ; foliola omnia siccitate tenuiter chartacea et viridia, margine subsinuosa, supra minute dissite adpresse pubescentia, subtus glauca et insuper dense adpresse cinereo-tomentella ; costa et nervi gracillimi, utrinque prominuli ; nervi primarii 6–8-jugi, patuli, subrecti vel leviter procurvi, usque ad ipsum marginem attingentes. *Inflorescentiae* praecoces, racemosae vel paniculatae, fasciculatae, 20–30 cm. longae, angustissimae, multiflorae, rhachibus inferne subteretibus superne angulatis minute subfulvo-tomentellis (pilis deflexis). *Flores* parvi, 7–8 mm. longi, pedicello 1 mm. longo pubescente, bracteolis minutis ovatis adpressis vix 1 mm. longis. *Calyx* campanulatus, 4 mm. longus, 2–2·5 mm. latus, purpureo-brunneus, adpresse fulvo-pubescens, dente superiore late ovato rotundato, dentibus 3 inferioribus parvis deltoïdeis acutis. *Corolla* purpureo-caerulea : vexillum (explanatum) orbiculare, 7–8 mm. diametro, brevissime unguiculatum, dente parvo prope basin utroque latere auctum ; alae oblongae, levissime falcatae, circiter 9 mm. longae et 2 mm. latae, obtusiusculae, circiter 1·5 mm. unguiculatae, lobulo acuto prope basin calcaratae ; carinae petala apice tantum cohaerentia, oblique spatulata, 8–9 mm. longa, 2·5–3 mm. lata, circiter 3 mm. unguiculata et dente brevissimo acuto aucta, apice oblique rotundato-truncata. *Stamina* 9 mm. longa. *Ovarium* cum stylo 9 mm. longum. *Legumen* (an omnino maturum?) parvum, oblongum, valde applanatum, usque 3 cm. longum et 7 mm. latum, 1–4-spermum, ubi semina aborta varie constrictum, basi et apice breviter attenuatum, suturis anguste incrassatis, undique breviter adpresse pubescens. *Semen* suborbiculare, applanatum, basi intrusum, 2·5 mm. diametro, laeve, brunneo-coccineum.

Siam. Doi Sutep : Chiengmai, 300–800 m., 28 May 1947, 2 and 21 March 1949, *K. Suvatabandhu* s.n. : " Woody climber with various sizes of globular or tapering tuberous roots. Leaves deciduous. Flower bluish-purple. Pod flat, squirrel's food." Vernacular name, *kwao kua*. Only large, old plants have been reported flowering.

This species is closely related to *Pueraria Candollei* Wall. ex Benth., of Burma and Thailand (*vide* Baker in Hook. f. *Fl. Brit. Ind.* **2,** 197 : 1876 ; Craib, *Fl. Siam. Enum.* **1** (3), 449 : 1928), but differs clearly in the cinereous, grey-green, closely tomentellous lower surface of the leaflets, in the shorter inflorescences (though this may not be constant), and in the much smaller flowers and fruits, the latter being distinctly pubescent.

The superficial resemblance of the leaves to those of *Butea superba* Roxb. is quite striking, but in the *Butea* the leaflets are usually thicker in texture, with a stouter midrib, and are frequently rounded or retuse at the apex. The grey-green pubescence of the *Pueraria* appears to be characteristic. It is evident that the two genera are very closely related.

Associated plants noted in the locality included : *Butea frondosa* Roxb., *B. superba* Roxb., *Xylia xylocarpa* (Roxb.) Taub., *Pterocarpus macrocarpus* Kurz, *Albizzia procera* (Roxb.) Benth., *Grewia* sp., *Schleichera trijuga* Willd., *Anthocephalus cadamba* (Roxb.) Miq., *Cananga latifolia* (Hook. f. et Thoms.) Fin. et Gagn., *Tectona grandis* L.f., *Lagerstroemia* sp., and, among the undergrowth, *Eupatorium* sp., *Kaempferia rotunda* L., and the orchid *Geodorum*. Among these, *Lagerstroemia* sp. and *Tectona grandis* were dominant.

Note on geology, soil and climate.

Dr. R. F. Pendleton and Kasin Suvatabandhu.

On further inquiry it was learned that this species grows in groups in the deciduous forests of Chieng Mai Province, Northern Thailand. The smooth, roundish, but rather steep slopes of the mountains on which it usually grows are between altitudes of 300 and 800 meters.

The type locality is on the south slope of Doi Sutep, a relatively isolated mountain of gneiss and schists of probably pre-Permian age. (Brown, Buravas and others, *Geologic Reconnaissance of the Mineral Deposits of Thailand.* Geologic Survey Bulletin 984 of U.S. Department, 1951).

As might be expected of soils developed on rather steep slopes, the soils in this locality are quite variable in depth and texture. As a whole the parent rock is " rotten " or weathered several meters deep ; the large quartz grains of the parent rock give the soil a sandy, or at times even a gravelly texture. In road cuts through this weathered material quantities of mica are conspicuous, though not as much so as in a poorer soil type on which this plant is not known to grow. Where the slope is not as steep there has not been so much erosion, hence there has been a greater accumulation of organic matter on and in the soil. The *p*H of 2 dried soil samples collected only a few meters apart is given as 5·9 and 5·4. A mechanical analysis by the Bouyoucos method is given below.

The Chieng Mai region is in the region of the summer monsoon rains, in which most of the rainfall falls between May and September ; October to March, inclusive, have little rain. The lowest recorded temperature is 2·8°C. (37°F.) in January and the highest recorded temperature is 39·5°C. (103°F.). During the clear winter months the dew is usually very heavy ; and early morning fog is common in most of the valleys in March and April.

ANALYSIS OF SOIL COLLECTED FROM DOI SUTEP MOUNTAIN

Particular	Sample No. 1	Sample No. 2
Lab. No. 69/95		
*p*H	5·9	5·4
Solubridge reading (mhox 10–5) ...	5 –	5 –
Moisture	1·88	2·04
Gravel	12·63	26·64
Coarse sand	33·48	26·92
Fine sand	24·83	20·30
Silt	12·25	9·93
Total colloid	25·58	22·65
Clay	18·37	19·97
Fine clay	16·58	16·42

Remarks : Mechanical analysis by Bouyoucos' Hydrometer method.

NOTES ON ASIATIC GRASSES : XI.

The genus Dimeria R. Br. in India and Burma.

N. L. Bor.

The genus *Dimeria* was established by Robert Brown in *Prodromus Florae Novae Hollandiae*, 204 (1810). The name, itself, is presumably derived from the Greek word, δίμερίς, meaning having two parts, and refers to the inflorescence which in the type species, *D. acinaciformis* R. Br., consists of two divergent tough racemes of spikelets.

Although the structure of the inflorescence and spikelets is more or less uniform all through the genus, it has no less than five other names. *Haplachne* was established by Presl for a plant from the Marianas. *Didactylon* was created by Zollinger and Moritzi for two grasses from Java. *Pterygostachyum* and *Psilostachys* were both proposed by Steudel, although he also lists *Dimeria* from which they differ in no respect. *Woodrowia* was established by Stapf for an Indian grass.

Characteristics of the Genus

The species of *Dimeria* are more or less gregarious and often cover appreciable areas. From the amount of anthocyanin which some of them possess, an amount which may increase as the plant matures, they are conspicuous members of the vegetation, very often colouring whole hillsides or abandoned fields red or dark-red. As habitats, the annuals grow where they can, often appearing as ruderals on clearings, slips, abandoned fields, and other casual places. The perennials demand a better habitat and are found in swamps and on more fertile soils.

All the members of the genus, except one (*Dimeria woodrowii* Stapf), are curiously alike, so that a species can be relegated to the genus without difficulty. The separation of species is not so easy and usually necessitates the use of a lens.

The unit of the inflorescence is a raceme, consisting of a rhachis which bears on its under surface a number of pedicelled spikelets, which usually are secund and overlapping, sometimes eventually spreading. An inflorescence may consist of one or more racemes.

The rhachis of the racemes is tough, linear or zig-zag and bears the spikelets on the under surface. In section the rhachis may be elliptic or planoconvex, that is, broader than thick, or triangular or circular, that is, not broader than thick. This character of the rhachis is a convenient character by which the genus can be divided into sections, and indeed, the members of each section seem to be closely related to one another. *Dimeria woodrowii* Stapf occupies a unique place in the genus because of the rhachis of the racemes which becomes coiled into a loop at maturity. A detailed description of this phenomenon is to be found at the end of the description of this species.

The pedicels, which are alternately arranged on both margins of the rhachis are conical when the rhachis is capillary, but distinctly flattened when the rhachis is compressed. In the former the spikelets usually stand out at an angle to the rhachis, in the latter they are firmly appressed to it. The compressed pedicels are most often ciliate on the outer

margins. The tip of the pedicels is usually concave and transversely truncate but in *D. acutipes* Bor, the articulation is extremely oblique and leaves the callus with a pointed tip.

The spikelets are strongly compressed and there is usually a definite callus which in some instances is long and obconical in shape, but is usually stout and compressed. There is little difference in the length of the glumes, though the upper is the longer. There is almost always a deep transverse cleft between the base of the lower glume and the upper margin of the callus. The lower glume is articulated at this point and in nearly all species makes an angle of over 60° with the upper glume at anthesis. The glumes are very thin on the margins, but become almost coriaceous towards the middle line. This thickness in the middle line is occasionally exaggerated, as in the species *D. blatteri* Bor and *D. stapfiana* C. E. Hubb., where the central portion of the upper glume becomes almost corky. This thickening of the central portion of the glume seems to be variable, for it is not always uniform even in spikelets of approximately the same age.

In the writer's opinion, the wings are the most important of the appendages to the glumes. The lower glume is rarely winged all along the keel, but such a wing is present in the species *D. bialata* Fisch. and *D. mooneyi* Raizada. Most often the lower glume is furnished with a wing only at the tip, and really takes the form of a very compressed tip. The upper glume is often strongly winged all along the keel and this wing is very constant and diagnostic for those species in which it is found. The wing can be of the texture of paper, as in *D. fischeri* Bor, or it may be very thick and corky as in *D. mooneyi* Raizada. Where the wing is confined to a small area below the tip, it is usually very conspicuously marked with green nerves.

The spikelets contain two florets—a reduced lower and a complete upper floret. The lower floret consists of a hyaline lemma only. This structure is uniformly oblanceolate in shape, with a rounded ciliate tip. The lemma is empty and the palea absent. The upper floral envelope consists of a bifid awned lemma, rarely accompanied by a minute palea, and contains a hermaphrodite flower. The number of stamens is two only, but on rare occasions three may be found. It was, doubtless, one of the abnormal spikelets that Robert Brown dissected when he gave three as the number of stamens in the diagnosis of his new genus. There are two lodicules.

The awn of the spikelet is perfect, strongly twisted at the base with a slightly twisted distal portion. In *D. woodrowii* the awn is reduced to the twisted base, while in *D. alata* Hook. f. it is absent altogether.

A word must be said here about the indumentum of the various parts. On the whole this is extremely variable and no reliance can be placed upon its presence or absence. The hairs, when present, on the sheath and leaves are almost always tubercle-based and fall off readily, leaving the bases behind. The hairy covering on the spikelets of certain species are simple and often comparatively long—these, too, are often caducous.

As will be seen from the key, the wing of the upper glume, its presence or absence, its shape, and so on, has been taken to be diagnostic. This view seems to be borne out by the facts, but there is one collection of

Thwaites in Ceylon which is sufficiently remarkable to require some comment.

This collection was named by Thwaites in *Enumeratio Plantarum Zeylaniae*, 369 (1864), *Dimeria ornithopoda* var. α *spiculis pubescentibus*. Sheets were distributed to Kew, Dehra Dun and Vienna as C.P. 956. On the Vienna sheet are (1) a plant which has been selected as the type of *D. pubescens* Hack. and (2) another species which Hook. f. called *D. trimenii*. The latter is a perennial and has only a small wing to the upper glume. The former is an annual and has a broad wing to the upper glume. On the Dehra Dun sheet there are three specimens which correspond to the type of *D. pubescens* Hackel and also three specimens of an undescribed grass which is an annual which differs in other respects from *D. trimenii*. At Kew there is one sheet of C.P. 956 which contains only the undescribed grass. Another sheet contains one specimen only of two annuals, one with the winged upper glume, i.e., *D. pubescens* and one with a wingless upper glume, namely, the undescribed grass (now known as *D. ceylanica* Bor).

It is not easy to understand how these three species came to be distributed under one number. One explanation of this state of affairs is that all these forms are one and the same species. This explanation must be rejected since it postulates that a species could exist in two distinct forms when it is an annual, and in an entirely different form when it is a perennial. It is far more likely that the three species were mixed after a day's collecting and distributed under one number because of a very superficial resemblance.

Former work on the genus.

The principal work on the genus is that of Hackel in DC., *Monogr. Phan.* **6,** 76–90 (1889), where he used as a basis for a first sub-division the number of racemes in the inflorescence. In this he has been followed by nearly all authors, Hook. f., Camus, Pilger, etc., up to the present day. Actually, however, the numerous collections which have been made since Hackel's time have shown that no reliance whatever can be placed upon this feature. In nearly all of those species which were supposed to possess only one raceme in the inflorescence, two, or even more, are to be found in certain specimens. Again, in species which as a rule have several racemes in the inflorescence, a single-racemed inflorescence is not by any means uncommon. The single raceme in a usually multi-racemed species is most likely occasioned by a poor habitat.

Hackel described twelve species, some of doubtful value, and at least one which is based on two distinct species. Hooker described twelve species from India and Burma in the Flora of British India. Since then some thirteen species have been described as new, and it is likely that further collection and observation in the field will bring other distinct species to light.

Hook. f., in the Flora of British India, dealt with the Indian, Burmese and Ceylon species, but, as he did not examine type sheets, had not always the same conception of a species as the author. For example, he cannot have seen the type sheet of *D. pubescens* Hack. which contains an annual grass and has two inflorescences of another species. In the *Flora of British India* he described *D. pubescens* Hack. as a perennial, but the

specimens he so named at Kew are all annuals and consist of a species quite distinct from those on the type sheet. He obviously had this conception of the plant in his mind when later on, in Trimen, *Flora of Ceylon*, he described *D. pubescens* Hack. as an annual and *D. trimenii* as a grass which " resembles what would be a very large stout perennial state of *D. pubescens* ". Actually, his *D. trimenii* is the other species referred to above which is pasted on the type sheet of *D. pubescens* Hack.

Again the type sheet of *D. lehmanii* Hack. var. β quoted by Hooker as such in the *Flora of British India* 105 (1896) under *D. lehmanii* is made the type of a new species, *D. alata* Hook. f., on the very same page. He again reversed this opinion in the *Flora of Ceylon*, and his *D. alata* is there relegated to the synonymy of *D. lehmanii*. It is, however, a distinct species.

Sections of the Genus.

The genus can quite conveniently be divided into the following sections :—

Section 1 : Capillares

Rhachis racemorum capillaris vel angustissima, trigona, sectione fere triangularis, exalata ; pedicelli conici haud compressi ; spiculae a pedicellis maturitate solutae.

D. ballardii Bor
D. blatteri Bor
D. fuscescens Trin.
D. gracilis Nees
D. hohenackeri Hochst.
D. stapfiana C. E. Hubb.
D. velutina Bor.

Section 2 : Loriformes

Rhachis racemorum compressa sectione elliptica vel plano-convexa, dorso plana vel paulo convexa, subtus convexa, alata vel exalata ; pedicelli valde compressi ; spiculae a pedicellis maturitate solutae.

D. acutipes Bor.
D. avenacea (Retz.) Fisch.
D. alata Hook. f.
D. bialata Fisch.
D. ceylanica Bor.
D. connivens Hack.
D. deccanensis Bor.
D. fischeri Bor.
D. kurzii Hook. f.
D. lawsonii (Hook. f.) Fisch.
D. lehmannii Hack.
D. mooneyi Raiz.
D. ornithopoda Trin.
D. orissae Bor.
D. pubescens Hack.
D. thwaitesii Hack.
D. trimenii Hook. f.

Section 3 : Annulares

Rhachis racemorum utrimque paulo convexa, primo recta demum maturitate annularis, spiculas intus gerens ; spiculae a pedicellis tarde secedentes.

D. woodrowii Stapf.

Generic Description.

Dimeria *R. Br.*

Haplachne Presl, Rel. Haenk. 234 (1830) t. 38.

Didactylon Zoll. et Moritzi, Verz. Pfl. Zoll. 99 (1854) nomen.

Psilostachys Steud., Syn. Pl. Glum. 413 (1855).

Pterygostachyum Nees ex Steud., Syn. Pl. Glum. 413 (1855).

Woodrowia Stapf in Hook., Ic. Pl. sub tab. 2447 (1896).

Spikelets reddish, greenish-olive or dark reddish-purple, firmly compressed, linear in outline, solitary, secund, all alike, pedicelled ; pedicels usually very short, rarely long, flattened rarely terete, tips truncate rarely oblique, alternately arranged on the under surface of a tough rhachis which may be capillary, or angled or flat on the upper surface and either convex or keeled on the lower surface, when flat the rhachis may be flexuous, zig-zag or straight, winged or wingless, glabrous or densely ciliate on the margins, rarely the rhachis curving upon itself and forming a hoop with the spikelets inside. *Florets* two in each spikelet. *Glumes* hyaline on the margins, chartaceous to leathery about the middle line, acute, obtuse, acuminate or occasionally produced into a feebly twisted arista, the lower usually without a wing on the dorsal surface but with a very narrow wing at the tip, the upper narrowly or broadly winged or wingless, both often ciliate along the whole back, with a few longer motile hairs at the tip ; wing papery or corky or when confined to the very tip with marked nervation. *Lower floret* empty ; *lemma* a hyaline scale half to three-quarters the length of the spikelet ; oblong-oblanceolate-acute in shape, ciliate on the margins in the upper half ; palea absent. *Upper floret* ♀ ; *lemma* hyaline, oblong- or elliptic-acute, split at the apex into two obtuse or acute lobes, between which issues the median nerve as a stout or slender, perfect or imperfect awn, or the awn rudimentary or absent ; *palea* absent ; *awn* usually with a dark, chestnut-coloured, twisted column and a slender scabrid bristle ; *stamens* 2 ; *anthers* linear, yellow ; *styles* 2 ; *stigmas* plumose, issuing laterally from the sides of the spikelet ; *lodicules* 2, very small, hyaline, cuneate ; *grain* terete, slightly laterally compressed ; *embryo* about one-third the length of the grain ; *hilum* basal, linear-punctiform.

Annual or perennial grasses, widespread in South East Asia, being found in India, Burma, Malaya, Siam, Indonesia, the Philippines, extending to other Pacific Islands and southwards into Australia. *Culms* extremely slender to almost robust, with hairy nodes. *Leaves* linear-acuminate hardly contracted at the base, almost always ascending, rarely spreading, with a well-marked mid-rib on the lower surface which is usually carried down on the sheath as a keel, glabrous or more often

densely covered with long colourless or white hairs from tubercle-bases ; *ligules* very short, membranous. Inflorescence of one to several racemes erect straight, curved, pressed together or widely divergent or, in one species, the inflorescence assuming the shape of a double hoop ; rhachis of the racemes tough.

Key to the species of *Dimeria*.

1. Spikelets 8–12 mm. long . . . . . 17. *D. blatteri*
1. Spikelets not above 7 mm. long :—
   2. Spikelets awnless, rather blunt, 3–3·25 mm. long ; upper glume broadly winged, 1 mm. broad ; lower glume winged just below tip 11. *D. alata*
   2. Spikelets awned :—
      3. Racemes 2 ; each rhachis circinately involute forming a hoop ; spikelets rather distant, imperfectly awned . 25. *D. woodrowii*
      3. Racemes 1–10 ; rhachis straight or flexuous :—
         4. Upper glume awnless, sometimes mucronate :—
            5. Perennials :—
               6. Rhachis flattened or triangular in section :—
                  7. Spikelets often fuscous, 5–7 mm. long ; acuminate or acute ; rhachis glabrous, triangular in section :—
                     8. Upper glume with a broad wing from base to apex ; racemes 2, widely divergent ; leaves congested at base where the internodes are very short 19. *D. ballardii*
                     8. Upper glume with a narrow wing or wingless ; racemes 2 or more, most often 3 ; internodes not shortened at base . . . . . 20. *D. fuscescens*
                  7. Spikelets not fuscous, pale often reddish to dark brown ; acute at the tip ; rhachis ciliate to densely pilose on the margins ; flattened :—
                     9. Upper glume with a broad papery wing ; spikelets 4–4·5 mm. long ; anthers 1–1·5 mm. long 21. *D. lehmannii*
                     9. Upper glume without a wing or the wing confined to an area just below the tip ; anthers 2 mm. long 22. *D. trimenii*
               6. Rhachis filiform :—
                  10. Sheaths smooth and glabrous ; nodes bare ; internodes of the raceme about 2·75 mm. long ; spikelets 5·5–6 mm. long . . . . . 23. *D. gracilis*
                  10. Sheaths and nodes covered with a dense covering of tubercle-based hairs ; internodes of the raceme 4–5 mm. long ; spikelets 6–7 mm. long 24. *D. velutina*

5. Annuals :—

11. Rhachis filiform or trigonous :—

12. Spikelets 3–3·5 mm. long, parallel to the rhachis ; pedicels less than 0·5 mm. long ; callus not longer than 0·25 mm. ; glumes not winged
10. *D. hohenackeri*

12. Spikelets 4–7 mm. long, spreading ; pedicels up to 2 mm. long ; callus not less than 0·5 mm. long ; upper glume with a rounded corky wing on the back
18. *D. stapfiana*

11. Rhachis flattened :—

13. Raceme one only :—

14. Upper glume not winged or if winged, winged at the tip only :—

15. Upper glume not winged, tip not recurved ; awn 12–18 mm. long ; spikelets 3–3·5 mm. long
5. *D. kurzii*

15. Upper glume winged just below the tip ; tip recurved ; awn 10–11 mm. long ; spikelets 5·5–6 mm. long . . . . . 3. *D. ceylanica*

14. Upper glume winged from base to apex :—

16. Lower glume with a thick corky wing ; wing of upper glume corky ; tip of upper glume acuminate . . . . . 9. *D. mooneyi*

16. Lower glume not winged ; wing of upper glume papery ; tip of upper glume acute
4. *D. fischeri*

13. Raceme more than one :—

17. Upper glume winged all along or at least at the tip :—

18. Upper glume winged all along :—

19. Upper glume narrowly winged all along the keel ; rhachis narrow, 0·75 mm. wide ; racemes rarely divergent ; spikelets 3·5–4 mm. long . . . . . 13. *D. connivens*

19. Upper glume broadly winged on the keel ; rhachis broader 1–1·25 mm. wide ; racemes usually divergent :—

20. Wing of the upper glume corky :—

21. Spikelet 4–6·5 mm. long ; both glumes broadly winged ; upper glume acuminate
9. *D. mooneyi*

21. Spikelet 3–3·5 mm. long ; upper glume with a corky wing ; upper glume acute
8. *D. bialata*

20. Wing of the upper glume thin and papery or chartaceous ; spikelets 5 mm. long
16. *D. pubescens*

18. Upper glume winged just below the tip only :—
22. Tip of the upper glume recurved
3. *D. ceylanica*
22. Tip of the upper glume not recurved :—
23. Spikelets 4–4·25 mm. long ; tip of the upper glume expanded into a papery wing ; anthers less than 1 mm. long . . 15. *D. orissae*
23. Spikelets 3·5 mm. long ; tip with a very minute wing ; anthers 1·5 mm. long
14. *D. deccanensis*
17. Upper glume not winged :—
Spikelets 1–3·5 mm. long . . 12. *D. ornithopoda*
4. Upper glume awned :—
24. Upper glume winged from base to apex :—
25. Rhachis of the racemes, flat on the back, winged, ciliate on the margins, 0·75 mm. wide, callus very short ; tip of upper glume recurved . . . . 6. *D. lawsonii*
25. Rhachis of the racemes very narrow, 0·4 mm. wide, not winged, callus up to 1·5 mm. long, tip of upper glume not recurved . . . . . 2. *D. avenacea*
24. Upper glume not winged along the back, if winged at all, at the tip only :—
26. Callus 1·5 mm. long, awn of upper glume 3 mm. long ; articulation between pedicel and callus extremely oblique . . . . . 1. *D. acutipes*
26. Callus 0·4 mm. long, awn of upper glume 1 mm. long ; articulation not oblique, transverse . 7. *D. thwaitesii*

1. Dimeria acutipes *Bor*, sp. nov. *D. avenaceae* proxima sed ab ea gluma superiore exalata satis recedit.

Gramen annuum culmis multis. *Culmi* usque 12 cm. alti, superne longiuscule nudi, gracillimi, laeves, glabri. *Foliorum laminae* 3–4 cm. longae, 1·5–2 mm. latae, lineares, acuminatae ; *vaginae* internodiis longiores, laxae ; *ligula* 1 mm. longa, membranacea, truncata, ciliata.

Racemi in culmi apice solitarii, usque 3 cm. longi ; rhachis plana angusta, 0·3 mm. lata ; pedicelli oblique articulata. *Spiculae* 4–5 mm. longae ; callus 1·5 mm. longus, barbatus, oblique articulatus. *Gluma inferior* 4 mm. longa, linearis, acuta, saepe aristata ; *gluma superior* 5 mm. longa, longe-aristata, exalata, carina lateribusque pilosa. *Anthoecium inferius* vacuum ; *lemma* 1·5–2 mm. longum, hyalinum, oblanceolatum, ciliatum ; *palea* nulla. *Anthoecium superius* ♀ ; *lemma* 3·5 mm. longum, elliptico-obtusum, bifidum, e sinu aristatum ; *palea* nulla ; *arista* circa 15 mm. longa ; *columna* castanea, torta, 4 mm. longa ; *styli* 2 ; *stigmata* plumosa ; *stamina* 2 ; *antherae* 0·5 mm. longae.

Dimeria acutipes *Bor.*

An annual grass with many culms from the base. *Culms* up to 12 cm. tall, very slender, terete, smooth, glabrous, shining, bearded at the

nodes. *Leaf-blades* 3–4 cm. long, 1·5–2 mm. broad, linear-acuminate, all ascending, slightly rounded at the base to the sheath, revolute on the margins, very minutely scabrid to almost smooth on the lower surface, very coarsely scabrid on the nerves of the upper surface, scabrid on the margins or not in the lower half but particularly rough on the margins towards the stout tip, further either thickly or sparsely villous with long, white, tubercle-based hairs on the upper surface in the lower half, sometimes the margins also ciliate with such hairs in the lower half ; *sheaths* much longer than the internodes, very loose, slipping from the culms, broadly hyaline on the margins, striate, smooth and glabrous, keeled in the upper half, rounded below ; *ligule* about 1 mm. long, membranous, truncate, ciliate on the upper margin.

Inflorescence a solitary raceme terminating the slender long-exserted peduncle, about 3 cm. long, curved or straight ; rhachis of the racemes very narrow, flat, 0·3 mm. wide, much narrower than the spikelets, triangular in section ; *pedicels* flattened, with a very oblique articulation with the callus of the spikelet, densely bearded on the outer edge. *Spikelets* 4–5 mm. long, not including the awn of the upper glume or the callus, much compressed, linear-oblong ; callus very well marked, 1·5 mm. long, very densely bearded with golden hairs. *Lower glume* 4 mm. long, without the callus, linear-acute in profile, ending in a very short arista, compressed but rounded on the back and sides, coriaceous with very narrow hyaline margins ; *upper glume* 5 mm. long, linear-acute, not winged, long-awned, straight on the back, strongly compressed, hyaline on the margins, firmer about the mid-nerve, keeled, pilose on the keel and side, produced at the tip into a straight slender, scabrid awn, 3–4 mm. long. *Lower floret* empty ; *lemma* a hyaline scale, oblanceolate in shape, 1·5–2 mm. long, ciliate in the upper half ; *palea* absent ; *upper floret* ♂ ; *lemma* 3·5 mm. long, elliptic-obtuse, shortly cleft at the tip and awned in the sinus ; *palea* absent ; awn about 15 mm. long ; *column* chestnut-coloured, twisted, 4 mm. long ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 0·5 mm. long.

Ind. Or. : Madras State, Sept. 1898, *Bourne* 35—paddy fields on the outskirts of Madras (typus in Herb. Kew.).

This species is distinguished from its closest relatives (1) *D. thwaitesii*, by the very much longer awn to the upper glume, the much longer callus and the very oblique articulation between pedicel and callus (2) *D. avenacea* by the absence of a wing on the upper glume and smaller spikelets.

2. Dimeria avenacea (*Retz.*) *C. E. C. Fischer* in Kew Bull. **1932,** 72 (1932).

Anthoxanthum avenaceum Retz. Obs. Bot. **3,** 8 (1783).

Dimeria pusilla Thw., Enum. Pl. Zeyl. 369 (1864).

An annual grass. *Culms* up to 22 cm. tall, erect from the base, capillary, smooth and glabrous, very leafy in the lower half, long exserted above, minutely bearded at the nodes. *Leaf-blades* up to 5 cm. long, 2–2·5 mm. wide, linear-acuminate in shape, garnished on the margins near the base with a few spreading long white hairs from tubercle-bases, otherwise smooth and glabrous or minutely scabrid on both surfaces, rounded at the

base and tapering to a point, more or less erect, not spreading, minutely scabrid on the margins ; *sheaths* rather loose, definitely keeled, smooth and glabrous, striate, broadly hyaline on the margins ; *ligule* continuous with the hyaline margins of the keel, 0·5 0·6 mm. long, membranous, lacerate and ciliate.

Inflorescence a single raceme 2–4·5 cm. long, terminating the long-exserted peduncle, consisting of a very narrow (0·4 mm. wide), flat inarticulate rhachis on the under surface of which are compressed spikelets alternately arranged on short pedicels ; pedicels obconic-truncate, bearded at the tips, 0·5 mm. long ; rhachis scabrid on the angles. *Spikelets* including the callus (1 mm. long) 6 mm. long, not including the awn of the upper glume ; callus slightly flattened and ciliate on the two edges and at the base. *Lower glume* 6 mm. long including a short cusp 1 mm. long, rounded and somewhat corky on the back, coriaceous, widely spreading at anthesis, coarsely scabrid near the tip. *Upper glume* 9 mm. long, including an awn 3 mm. long, oblong-acute in profile, strongly compressed laterally, smooth and glabrous, broadly winged from base to apex ; wing papery, scabrid on the free edge. *Lower floret* empty ; *lemma* 2·5 mm. long, very narrow, oblanceo-late, ciliate on the upper margin ; *palea* absent. *Upper floret* ♀ ; *lemma* oblong-acute, shortly bifid at the tip, hyaline, glabrous, 3·5 mm. long ; *awn* 13 mm. long, of which 5 mm. constitute a twisted chestnut column ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 0·8 mm. long ; *lodicules* 2, minute.

Ind. Or. : Madras State : Kambakkam Hills, Chingleput District, 15 Mar. 1901, *Bourne* 2466 ; Ceylon : Kokotadua, *Gardner* (C.P. 957 in part).

Bourne's plant is an exact match for Retzius' type of *Anthoxanthum avenaceum* Retz. which is at Lund.

The Ceylon form of this plant is more robust, the racemes are longer, the spikelets larger and longer awned, the rhachis is more flattened, but I do not consider any of these differences to be of specific significance. The variety may be kept up as **D. avenacea** (*Retz.*) *C. E. C. Fisch.* var. **elatior** (*Hook. f.*) *Bor* comb. nov.

Ind. Or. : Ceylon, Trincomalee, *Glennie* (C.P. 957 in part).

3. **Dimeria ceylanica** *Bor* sp. nov., *D. kurzii* Hook. f., *D. orissae* Bor et *D. deccanensi* Bor comparanda sed ab eis tribus gluma superiore infra apicem recurvatum anguste alata et spiculis multo majoribus recedit.

Gramen annum. *Culmi* usque 70 cm. alti, erecti, laeves glabrique, nodis barbati. *Foliorum laminae* lineares, acuminatae, erectae nec patentes, utrimque pilis e tuberculis ortis tectae, utrinque scabrae, marginibus scabrae ; vaginae inferne laxae et a culmis solutae, superne arcte complectentes, pilis e tuberculis ortis dense pilosae vel glabrescentes, superne carinatae, inferne rotundatae ; *ligula* membranacea, ciliata, truncata, 1 mm. longa.

Racemi in culmi apice singuli vel rarius gemini, 6–10 cm. longi, recti vel curvati ; rhachis plana, haud vel angustissime alata, marginibus ciliata ;

pedicelli breves, explanati. Spiculae compressae, 4·5–5 mm. longae, callo breve barbato. *Gluma inferior* 4–4·5 mm. longa, lineare-acuminata, dorso pilis albis pilosa ; *gluma superior* 4·5–5 mm. longa, apice acuminata, infra apicem recurvatum anguste alata, dorso lateribusque pilis albis longis dense pilosa. *Anthoecium inferius* vacuum ; *lemma* 2·5 mm. longum, hyalinum, oblanceolatum, ciliatum ; *palea* nulla. *Anthoecium superius* ♀ ; *lemma* hyalinum, bifidum, e sinu aristatum, 3 mm. longum ; *palea* nulla ; *arista* 10–11 mm. longa ; *columna* torta, castanea, 3 mm. longa ; *styli* 2 ; *stigmata* plumosa ; *stamina* 2 ; *antherae* 2 mm. longae.

Dimeria ceylanica *Bor.*

An annual grass. *Culms* up to 70 cm. tall, erect from the base, terete, smooth and glabrous or sometimes with rather sparse weak hairs below the nodes, leafy, long-bearded at the nodes. *Leaf-blades* linear-acuminate in shape, erect not spreading, somewhat rounded at the base to the sheath, up to 20 cm. long, 2–4 mm. wide, covered on both sides, often densely, with a mat of bulbous-based hairs which fall off as they grow old, leaving the tubercules behind, scabrid on both surfaces, scabrid on the margins but more particularly towards the tip which is almost cartilaginous, with a mid-rib very prominent below, which is carried down on the upper part of the sheath as a keel ; *sheaths* loose below and slipping from the culm, rather tight above, distichous below, becoming scarious, smooth and shining, usually covered with a thick mat of bulbous-based hairs or almost to quite glabrous in the lower half, rounded on the back in the lower half, keeled above, hyaline on the margins ; *ligule* membranous, about 1 mm. long, truncate, ciliate.

Inflorescence most often of one, occasionally of two racemes terminal to the long-exserted peduncle ; racemes 6–10 cm. long, straight or curved ; rhachis straight, stout, flat or slightly convex on the dorsal surface, ciliate on the margins, hardly winged, without an intramarginal line, keeled and glabrous on the lower surface, furnished with alternately arranged short pedicels ; pedicels flat, linear with a pronounced lip at the shallowly concave top. *Spikelets* much compressed, 4·5 -5 mm. long, with a very short bearded callus. *Lower glume* 4–4·5 mm. long, linear-acuminate in profile, straight or nearly so on the back, very compressed, not winged or with an extremely narrow wing in the upper third, keeled in the upper half, rounded below, covered all over the back with a dense row of hairs, ciliate along the side nerves(?) ; *upper glume* 4·5–5 mm. long, elliptic-acuminate if flattened, much compressed and keeled in the upper half, rounded on the back in the lower half, with the acuminate tip slightly recurved, covered all along the dorsal surface and on the sides with soft, white hairs, with an extremely narrow wing in the upper quarter just below the tip ; tip of wing always acuminate. *Lower floret* empty ; *lemma* a hyaline scale, 2·5 mm. long, oblanceolate-acute in shape, ciliate on the margins in the upper half ; *palea* absent. *Upper floret* ♀ ; *lemma* elliptic-acute in shape, hyaline, cleft at the tip into two short lobes, 3 mm. long, awned in the sinus ; *awn* 10 -11 mm. long ; *column* twisted, dark brown, 3 mm. long ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 2 mm. long.

Ind. Or. : Madras State, Mysore, Chickenalli, 1000 m., Nov. 1908, *Meebold* 10755 ; ibidem, Aglatti, 1100 m., *Meebold* 10754 (both of these

are 2-racemed) ; Kavalay, Cochin, 1000 m., Nov. 1910, *Meebold* 12187. Ceylon, *Gardner* 1008 ; *Thwaites* 956 pro parte (typus in Herb. Kew. et in Herb. Dehra Dun) ; Ramboda Pass, on roadside bank, 1000 m., 17 Dec. 1950, *Ballard* 1148.

This is one of the three species of *Dimeria* which have been distributed under C.P. 956, and which are discussed on page 555.

4. Dimeria fischeri *Bor*, sp. nov. *D. lawsonii* (Hook. f.) C. E. C. Fisch. proxima sed ab ea spiculis minoribus, gluma superiore latiore, glumae superioris apice haud aristata satis recedit ; a *D. avenacea* (Retz.) C. E. C. Fisch. spiculis minoribus, rhachidibus racemorum latioribus gluma superiore exaristata distincta.

Gramen annuum. *Culmi* usque 10 cm. alti, laeves, glabri, nodis barbati. *Foliorum laminae* usque 5 cm. longae, 2 2·5 mm. latae, lineares, acuminatae, laeves, glabrae, utrimque scabrae, vel marginibus basi pilis albis e tuberculis ortis ornatae, marginibus minute scaberulae ; *vaginae* laxae, carinatae, laeves, glabrae ; *ligula* brevis, 0·5 mm. longa, membranacea, lacerata, ciliata.

Racemi in apicibus culmorum singuli, 2–4·5 cm. longi ; rhachis plana, 0·75 mm. lata, marginibus ciliata ; pedicelli brevissimi. *Spiculae* 4 mm. longae. *Gluma inferior* 3·5 mm. longa, dorso dense pilosa ; *gluma superior* 3·5 mm. longa, dorso per totum decursum alata, margine alae dense ciliata. *Anthoecium inferius* vacuum ; *lemma* 2 mm. longum, hyalinum, oblanceolatum, ciliatum ; *palea* nulla. *Anthoecium superius* ♀ : *lemma* 2 mm. longum, hyalinum, apice bifidum, e sinu aristatum ; *palea* nulla ; arista 10 mm. longa ; *columna* 3·5 mm. longa, torta, castanea : *styli* 2 ; *stigmata* plumosa ; *stamina* 2 ; *antherae* 0·8 mm. longae ; *lodiculae* 2, minutae.

Dimeria fischeri *Bor.*

An annual grass. *Culms* up to 10 cm. tall, few to many, erect, smooth and glabrous, except at the nodes which are bearded, leafy. *Leaf-blades* linear-acuminate, rounded at the base to the sheath, 1–7 cm. long, 1–4 mm. wide, glabrous on both surfaces except towards the base of the upper surface which is garnished on the margins or just inside the margins with long white hairs from bulbous bases, or covered with such hairs, smooth to very minutely scabrid on both surfaces, except towards the stout tip which is scabrid, serrately scabrid on the margins, particularly towards the tip ; *leaf-sheaths* rather loose and slipping from the culms, definitely keeled, smooth and glabrous, hyaline on the margins ; *ligule* a very short (0·5 mm. long) membrane, lacerate and ciliate at the top.

Inflorescence a single raceme terminating the hardly exserted peduncle ; raceme 2–3 cm. long, consisting of a tough flat rhachis, ciliate on both edges, 0·75 mm. wide, bearing alternately arranged spikelets pressed to the under surface of the rhachis ; pedicels very short, flattened, concave at the upper end, ciliate on the outer edge, thick, densely bearded at the upper margin. *Spikelets* 4 mm. long, including the densely bearded callus, which is 0·5 mm. long, firmly compressed. *Lower glume* 3·5 mm. long, excluding the callus, 1 mm. wide, strongly compressed, narrow,

linear-acute in profile, thin on the margins, almost coriaceous on the rounded keel, densely hairy all along the keel. *Upper glume* 3·5 mm. long, 2·4 mm. wide excluding the callus, 2 mm. wide if flattened, very strongly compressed, keeled, winged all along the keel from just above the base, very thin on the margins but much firmer at the keel, densely ciliate on the whole length of the wing. *Lower floret* empty ; *lemma* a hyaline scale, oblanceolate in shape, 2 mm. long, ciliate on the upper half of the margins ; *palea* absent. *Upper floret* ♀ ; *lemma* 2 mm. long, 1 mm. wide, hyaline, cleft in the middle into two substantial lobes from the sinus between which comes a perfect awn ; *palea* absent ; *awn* 10 mm. long, of which the lower 3·5 mm. constitute the dark-coloured twisted column ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 0·8 mm. long ; *lodicules* 2, minute.

Ind. Or. : Madras State, Mahendragiri, *C. E. C. Fischer* 133 (typus in Herb. Kew.).

This species has been confused with *D. avenacea* (Retz.) Fisch., but, apart from the absence of the awn to the upper glume, the spikelets are much smaller. It is perhaps closest to *D. lawsonii* (Hook. f.) C. E. C. Fischer, but differs from it in the smaller spikelets, broader upper glume and absence of the drawn out recurved tip to the upper glume.

5. Dimeria kurzii *Hook. f.*, Flor. Brit. Ind. **7,** 103 (1896).

An annual grass. *Culms* very slender, capillary, terete, smooth and glabrous, up to 60 cm. tall, erect from the base, several-noded, with the terminal internode long-exserted from the sheath, bearded at the nodes. *Leaf-blades* 4–8 cm. long, 2–3·5 mm. wide, linear-acute in shape, covered on both surfaces, and particularly so on the upper, with tubercle-based white hairs, ciliate on the margins with the same type of hairs, coarsely scabrid on the margins near the tip, minutely scabrid on both surfaces, with a very prominent mid-rib below which is carried down on the sheath, rounded at the base to the sheath ; *sheaths* smooth and shining in their lower halves, with many tubercle-based hairs from the grooves between the nerves in the upper halves, sharply keeled in the upper half, round on the back and shiny on the lower half, rather loose at the base of the plant ; *ligules* membranous, 0·5–1 mm. long, ciliate on the upper margin.

Inflorescence a solitary, straight or curved, raceme, 3·5 (5·5) cm. long, seated on the enlarged tip of the long-exserted peduncle ; rhachis of the raceme tough, narrowly winged, thickly ciliate all along each margin, furnished on the under surface with alternately arranged very short, flat pedicels which have a hair or two on the margins of the concave tip. *Spikelets* 3–3·5 mm. long, very compressed, oblong, with a very short bearded callus, caducous from the pedicels. *Lower glume* very narrow, oblong-acute in profile, strongly compressed, 2·5 mm. long, very shortly aristate or without an arista, densely ciliate on the keel with short white hairs, also covered on the sides in the lower half with the same type of short white hair ; *upper glume* 3–3·5 mm. long, strongly compressed, keeled, 3-nerved, densely ciliate on the two lateral nerves and on the keel, with a few longer hairs towards the tip, oblong-acuminate in shape.

Lower floret empty ; *lemma* 1·5 mm. long, hyaline, oblanceolate ; palea absent. *Upper floret* ♀ ; lemma 2 mm. long, narrowly elliptical in shape, cleft at the tip into two hyaline lobes ; *palea* absent ; *awn* 12 (18) mm. long ; *column* 4 mm. long ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 0·6 mm. long.

Burma : Pegu, Irrawady and Sittang Valley, 27 Dec. 1870, *S. Kurz* 2741 (typus in Herb. Kew.) ; Mergui, *Griffith* 6798 ; Shawdon (Salu Reserve) South Pegu Division, 28 Nov. 1939, *U. Thein Lwin.*

This very graceful species seems to be comparatively rare. The specimen collected by U Thein Lwin has spikelets which are covered with long, silky, silver hairs with a much longer awn. I hesitate to make it a variety until more is known of this plant.

6. Dimeria lawsonii (*Hook. f.*) *C. E. C. Fisch.* in Gamble, Flor. Madras 1713 (1934).

D. pusilla Thw., Enum. Pl. Zeyl. 369 (1864) var. *lawsonii* Hook. f. Flor. Brit. Ind. **7,** 103 (1896).

An annual grass. *Culms* slender, few or many from the base, up to 26 cm. tall, smooth and glabrous, somewhat decumbent at the base, finally erect, shortly bearded at the nodes. *Leaf-blades* linear-acuminate, up to 8 cm. long, 2–3 mm. broad, many nerved, with the main nerves strongly marked, glabrous, save from a few widely spaced long (3–5 mm.) white, bulbous-based hairs on the lower third of the upper surface, minutely scabrid on both surfaces and on the margins which are thinly cartilaginous ; *sheaths* very loose, longer or shorter than the internodes, slipping from the culm, smooth and glabrous, striate, very broadly hyaline on the margins, obscurely keeled ; *ligule* an opaque, ciliate, lacerate membrane 0·5 mm. long.

Inflorescence consisting of a solitary raceme, 3–3·5 cm. long, terminating the *culm* ; axis of the racemes, tough, inarticulate, straight or curved, winged, ciliate on the margins, 0·75 mm. wide ; pedicels compressed, ciliate on the outer margin, concave at the tip. *Spikelets* readily deciduous from the pedicels, 5·5 mm. long, compressed. *Lower glume* 4·5 mm. long, much compressed, keeled, narrowly oblong-acuminate in profile, very thickly ciliate along the keel, somewhat coriaceous ; *upper glume* 5·5 mm. long, 1·6 mm. wide, with a long drawn-out slightly recurved tip, elliptic-acuminate when flattened, keeled, narrowly winged all along the keel from the base, or from a point about one-third its length from the base, coriaceous on the keel but chartaceous to hyaline at the sides, densely ciliate all along the keel. *Lower floret* empty ; *lemma* a very narrow, oblanceolate, hyaline scale, 2–3 mm. long ; *palea* absent. *Upper floret* ♀ ; *lemma* 2·5–3 mm. long, 1 mm. broad, hyaline, oblong, tapering to an obtuse bifid tip ; awned in the sinus ; *awn* 8 mm. long ; lower 3·5 mm. a twisted, chestnut-brown column ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 0·8–0·9 mm. long ; *lodicules* 2, small.

Ind. Or. : Madras State, Wynaad, 24 Nov. 1888, *Lawson* 22 ; Coorg, 1896, *A. G. Laurie.*

D. kurumthotticalana K. C. Jacob in *Journ. Bomb. Nat. Hist. Soc.* **47,** 49 (1947), is described as being related to *D. lawsonii* and to differ from it in the size of the spikelets and the nature of the wing of the upper glume. As I have not seen the type specimen, I can form no opinion as to the validity of the species.

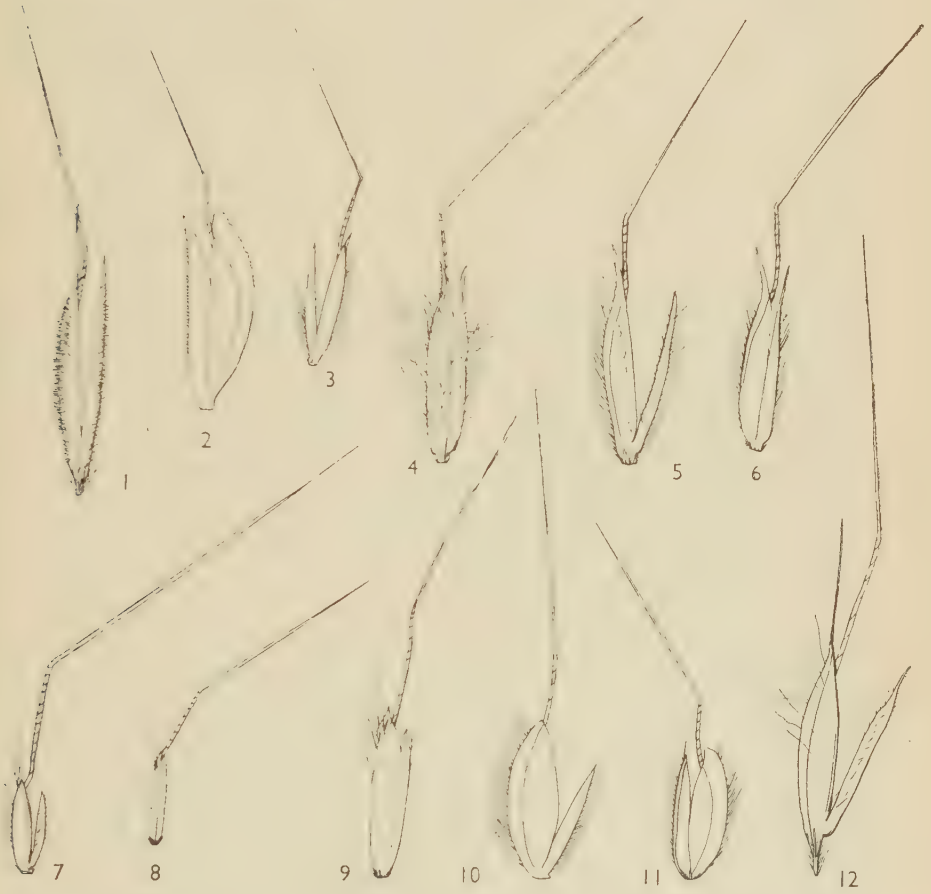


Fig. 1. Spikelet-silhouettes : 1. *Dimeria thwaitesii* Hack. : 2. *D. ballardii* Bor : 3. *D. deccanensis* Bor : 4. *D. gracilis* Nees : 5. *D. lawsonii* (Hook. f.) C. E. C. Fisch. : 6. *D. lawsonii* (Hook. f.) C. E. C. Fisch. : 7. *D. kurzii* Hook. f. : 8. *D. ornithopoda* Trin. from type sheet : 9. *D. orissae* Bor : 10. *D. fischeri* Bor : 11. *D. bialata* C. E. C. Fisch. : 12. *D. avenacea* (Retz.) C. E. C. Fisch. All × 6.

7. Dimeria thwaitesii *Hack.* in DC., Monogr. Phan. **6,** 78 (1889).

D. pusilla Thw., Enum. Ceyl. Pl. 369 (1864) var. *pallida* Thw. ex Hook. f., Flor. Brit. Ind. **7,** 103 (1896).

A very slender annual. *Culms* capillary, up to 25 cm. tall, erect or shortly decumbent at the base and rooting from the lower nodes, up to 25 cm. tall, leafy at the base, smooth and glabrous, sparsely bearded at the nodes ; internodes long, much longer than the sheaths. *Leaf-blades* linear, rounded at the base, tapering to a stout acuminate point, furnished with a few spaced long bulbous-based hairs on or close to the margins at

the base on the upper surface, otherwise glabrous, very minutely scabrid or smooth on both surfaces, smooth on the margins below but coarsely scabrid at and near the tip ; *sheaths* loosely wrapped round the culms, much shorter than the internodes, smooth and glabrous, keeled, hyaline on the margins ; *ligule* a very short lacerate and ciliate membrane.

Inflorescence a single raceme terminating the long exserted peduncle ; rhachis of the racemes 2·75 cm. long, tough, flattened and somewhat winged, convex on the under surface, glabrous save for the ciliate margins; pedicels very short, flattened, concave above, ciliate on the two edges. *Spikelets*, including the short awn of the upper glume 5·5 mm. long ; callus 0·4 mm. long, bearded. *Lower glume* 4 mm. long, strongly compressed, narrow, rounded on the keel which is somewhat coriaceous, thinner on the margins, pilose all over the back with short white hairs ; *upper glume* 5·5 mm. long, firmly compressed and keeled, coriaceous about the keel, thinner on the margins, not winged except towards the tip, and then only very narrowly, pilose on the back with short white hairs, produced at the tip into a short awn. *Lower floret* empty ; *lemma* a very narrow, oblanceolate, hyaline scale 2·5 mm. long, ciliate on the upper margins ; *palea* absent. *Upper floret* ♀ ; *lemma* 2·5 mm. long, 1 mm. broad, oblong-obtuse, bifid at the top, hyaline ; *awn* 10 mm. long, of which the lower 3·5 mm. constitute a chestnut-coloured, twisted column ; *styles* 2 ; *stigmas* pilose ; *stamens* 2 ; *anthers* 0·5 mm. long ; *grain* 2 mm. long, terete ; *lodicules* 2, very small.

Ind. Or. : Ceylon, Damboul, Mar. 1868, *Thwaites* 3965 (typus in Herb. Mus. Palat. Vindob.).

8. Dimeria bialata *C. E. C. Fischer* in Kew Bull., **1933,** 351 (1933).

An annual grass. *Culms* 10–45 cm. tall, very slender, smooth and glabrous, terete, erect, about 6-noded, bearded at the nodes. *Leaf-blades* when basal much longer and broader than those of the culm-sheaths, linear-acute in shape, 2·5–7 cm. long, 2·5 mm. broad, hardly rounded to the sheath, closely covered on both surfaces with long white hairs from bulbous bases, erect not spreading, scabrid on both surfaces and on the margins, which are also ciliate with long tubercle-based hairs, scabrid at the stout tip, those of the uppermost culm sheaths reduced and rudimentary ; mid-rib prominent below continued into the sheath ; *sheaths* loose, sharply keeled in the upper half, rounded on the back below, smooth and glabrous below but with numerous tubercle-based hairs from the grooves between the striations above ; *ligules* membranous, truncate, 0·5–1 mm. long, ciliate on the upper edge.

Inflorescence a pair of divaricate racemes seated upon a peduncle which is sometimes long-exserted ; racemes 2·5–3·5 cm. long, consisting of a tough, flat, straight rhachis which is winged on the margins, scabrid on the wings, carrying on the under surface, alternately arranged flat, extremely short, pedicels concave on the upper margin. *Spikelets* 3·5–4 mm. long, much compressed, with a callus 0·5 mm. long. *Lower glume* 3–3·25 mm. long, linear-acute in profile, strongly compressed and keeled, narrowly winged on the keel, ciliate all along the margin of the wing, with some longer hairs towards the apex, coriaceous on the keel but thinner on the margins ; *upper glume* 3·5 mm. long, 1 mm. wide, very

much compressed, thin on the sides and with a thick opaque wing on the keel ; wing 0·5 mm. wide, curved, shortly ciliate all along. *Lower floret* empty ; *lemma* a hyaline scale, oblong, ciliate on the margins above ; *palea* absent. *Upper floret* ♀ ; *lemma* 2·5 mm. long, elliptical, hyaline, glabrous, cleft at the tip into 2 lobes ; *palea* absent ; *awn* issuing from between the lobes, 9–11 mm. long, the lower 2·5–4 mm. being the dark coloured, twisted column ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 1 mm. long ; *lodicules* not seen.

Ind. Or. : Madras State, South Kanara, Siradi, Nov. 1908, *Meebold* 10548 (isotypus in Herb. Kew.)—abundant, predominant in places ; ibidem *Meebold* 10752.

9. Dimeria mooneyi *Raizada ex Mooney*, Suppl. Bot. Bihar and Orissa, 263 (1950).

An annual grass. *Culms* up to 20 cm. tall, terete, stiff, erect, smooth and glabrous, 3–6-noded, leafy, not branched, bearded at the nodes. *Leaf-blades* lanceolate- to linear-acuminate, rounded at the base to the sheath, 2–6 cm. long, 2–3 mm. wide, thickened on the margins, very minutely scabrid or smooth on both surfaces, scabrid on the margins particularly towards the stout tip, erect not spreading, clothed on both surfaces with tubercle-based white hairs to almost glabrous, usually with a few, spaced tubercle-based hairs on the margins below ; *sheaths* somewhat loose and slipping from the culm, becoming scarious when old, very hyaline on the margins, smooth and glabrous or more or less covered in the upper half with bulbous-based hairs, keeled in the upper half ; *ligule* a truncate membrane, less than 1 mm. long, ciliate.

Inflorescence of two silky racemes of spikelets, at first closely pressed together, eventually divergent ; rhachis linear, flat, very narrowly winged, 1·5 mm. wide, green, thickly or somewhat sparsely ciliate on the margin, 5·5 cm. long, keeled on the ventral surface, and furnished with alternately arranged, flattened pedicels which are about 0·5 mm. long, and more or less densely bearded from the concave tip. *Spikelets* very compressed, 4–6·5 mm. long, 2 mm. wide, cream-coloured, with bright green markings near the tip, with a short bearded callus 0·5–1 mm. long, not appressed to the rhachis. *Lower glume* 4·5–5 mm. long, narrowly oblong-acuminate in profile, with a thick wing on the back in the lower two-thirds, ciliate all along the dorsal surface with hairs getting longer towards the tip, much compressed ; *upper glume* 5–5·5 mm. long, very thickly winged along the keel to the beak-like tip, long ciliate all along the keel, compressed, almost hyaline on the margins, ciliate on the hyaline margins. *Lower floret* empty ; *lemma* a hyaline, oblong scale, ciliate on the margins near the tip, about 3 mm. long ; *palea* absent. *Upper floret* ♀ ; *lemma* hyaline, 2·5–3·5 mm. long, elliptic-acute, cleft at the tip into two acute lobes ; *palea* absent ; *awn* 13–15 mm. long ; *column* dark chestnut, twisted, 5 mm. long ; styles 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 1·75 mm. long ; *lodicules* 2, truncate, obcuneate, minute.

Ind. Or. : Orissa ; southwest of Sambalpur district, close to Sonabera village, 700 m., Sept.–Oct. 1949, *H. F. Mooney* 3652 (typus in Herb. Kew.) ; in clefts and crevices of massive quartzite outcrop—only observed in this locality and in this arid habitat ; ibidem, *H. F. Mooney*

3657 ; near Raisili village, not far from Laxmipur, Koraput Dist., 1000 m. 25 Oct. 1950, *H. F. Mooney* 4240—crevices in bare granite-gneiss outcrop in hot exposed situation, moist only during monsoon up to end of September ; Madras State : Shimoga, Mysore, 650–690 m., Oct. 1908 *Meebold* 10751—on granite rocks.

This species is very close to *D. bialata* C. E. C. Fischer and may have to be reduced to it when more is known of the latter. It is, however, very much larger than *D. bialata* in all its parts and bears a somewhat similar relation to it as *D. blatteri* Bor does to *D. stapfiana* C. E. Hubbard.

10. Dimeria hohenackeri *Hochst. ex Miq.* in Verh. Ned. Istit. **3,** 35 (1851).

Psilostachys hohenackeri (Hochst.) Steud., Syn. Pl. Glum. 413 (1855) nom. illegit. (*Psilostachys* Hochst. (1844) is a genus of *Amarantaceae*.

An annual grass. *Culms* very slender, up to 60 cm. tall, with the basal leaves short, forming a kind of rosette, smooth and glabrous, terete, shortly bearded at the nodes. *Leaf-blades* of the basal sheaths short, crowded, spreading, 3–6 cm. long, 2–4 mm. wide, linear-acute or linear-acuminate, tapering to a stout, scabrid point, flat, flaccid, covered on both surfaces at first with a thick coat of bulbous-based white hairs which soon fall off, leaving behind the bases, ciliate on the margins with the same type of hair, most minutely scabrid on both surfaces, or apparently quite smooth, scabrid on the margins ; *sheaths* keeled, smooth and glabrous in their lower half, covered with caducous tubercle-based hairs in the upper half, hyaline on the margins, smooth and shiny in the lower half ; *ligule* a very short, lacerate, ciliate membrane 0·5–1 mm. long.

Inflorescence of 3–4, subdigitately arranged, racemes 4–12 cm. long ; rhachis of the racemes capillary, angled and scabrid on the angles, with nodes about 3 mm. apart, glabrous ; pedicels very short, obconical, glabrous. *Spikelets* 3·5–5 mm. long, very narrow, with a minute callus (0·25 mm.), much compressed, not winged on either glume, not spreading but parallel to the line of the rhachis. *Lower glume* 4–5 mm. long including the callus, very narrow, 0·6 mm. wide when flattened, rounded on the back, compressed, with a few short hairs on each side below, scabrid on the back and sides near the tip ; *upper glume* 4·5–6 mm. long, very narrow, oblong-acuminate in profile, not winged, compressed, hyaline on the margins, covered sparsely on the dorsal surface with short white hairs. *Lower floret* empty ; *lemma* 2·8–3 mm. long, oblanceolate-acute in shape, ciliate on the margins above, hyaline ; *palea* absent. *Upper floret* ♀ ; *lemma* 3·5–4 mm. long, narrowly elliptic-acute, cleft at the tip into two acute lobes ; *palea* absent ; *awn* inserted between the lobes 3 mm. long ; *column* 4 mm. long ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 1·5–2·5 mm. long, yellow ; *lodicules* obcuneate-truncate, toothed.

Ind. Or. : Madras State, in oryzetis prope urbem Mangalor, Sept. 1847, *Hohenacker* 231 (typus in Herb. Kew.) ; South Kanara, Upin Ongadiz Nov. 1908, *Meebold* 10497 ; Nileshwar, no. 2 station, collector unknown ; Pilicode, no. 1 station, collector unknown.

Another synonym for this species is *Arthraxon hohenackeri* Hochst. ex Steud. Syn. Pl. Glum. 413 (1855). Steudel actually quotes the type number of Hohenacker's collection upon which *Dimeria hohenackeri* Hochst. is based. Hochstetter pointed out in Flor. 190 (1856) that Steudel wrote *Arthraxon* for *Dimeria* in error !

The type specimen of *Dimeria hohenackeri* Hochstetter, was collected in rice fields in the neighbourhood of Mangalore, a town on the coast of the district of South Kanara, Madras State. The type sheet at Kew, no. 231 of Hohenacker's collection, contains about a dozen very slender, almost capillary, culms of an annual species of *Dimeria*. Most of the culms are without leaves, but one or two do show leaves which are mainly basal and reddish in colour. In slenderness of the culms this species approaches *D. ornithopoda* Trin. var. *gracillima* Bor, but the rhachis of the racemes is very different being capillary and not flat, while the spikelets, 3·5–4 mm. long, are much larger.

Nothing resembling this specimen in its delicate slenderness has before or since been collected in Madras, a State in which vast collections have been amassed during the past two hundred years. One of constrained to believe that the type of Hochstetter's species is not typical and may have been collected when growing in, for it, an unfavourable habitat.

This supposition is strengthened by the fact that there are at Kew several gatherings of *Dimeria* sp. from South Kanara in Madras State. These specimens of *Dimeria* are annuals, with leaves, mainly basal, which turn red on fading. The culms are slender, but not so slender as in Hohenacker's gathering, and are quite robust in stronger specimens. The spikelets do not vary from those of the type, except that on the whole they are slightly larger.

There is little doubt therefore that the specimens which constitute the type of Hochstetter's *Dimeria hohenackeri* were collected from a habitat which is not the normal habitat of the species. The normal habitat is dry ground and not the swampy ricefields where the type specimen was found.

This species can easily be confused with *D. stapfiana* C. E. Hubb. but it differs from it not only in appearance but also in the following particulars, (1) the pedicels are very short, (2) the spikelets are parallel to the rhachis and not spreading as in *D. stapfiana*, and (3) the leaves are mainly basal.

11. Dimeria alata *Hook. f.*, Flor. Brit. Ind. 7, 105 (1896).

D. ornithopoda Trin. var. δ *mutica* Thwaites, Enum. Pl. Zeyl. 369 (1864).

D. lehmannii Hack. var. *mutica* Hack. in D.C., Monogr. Phan. **6,** 83 (1889).

Pterygostachyum lehmanii Ness ex Steud. Syn. Pl. Glum. 413 (1855).

A perennial grass. *Culms* up to 45 cm. tall, terete, erect or shortly decumbent at the base, smooth and glabrous, or covered with long white hairs from tubercle-bases, bearded or glabrous at the nodes. *Leaf-blades* linear-acuminate in shape, 15 cm. long, 3·5 mm. wide, narrowly rounded at the base to the sheath, covered on both surfaces with a dense

or sparse mat of tubercle-based hairs, tapering to a stout point, erect not spreading, scabrid on both surfaces and on the margins, particularly towards the tip ; *sheaths* on the upper part of the culm tight, clasping, those at the base rather loose and slipping from the internode, smooth and glabrous or densely covered with tubercle-based hairs which arise from the grooves between the nerves ; *ligule* a short membrane less than 1 mm. long, truncate, ciliate on the margin.

Inflorescence of two to three racemes terminal to the long-exserted peduncle ; racemes up to 8·5 cm. long ; rhachis straight, tough, convex on the upper surface, keeled on the lower surface, glabrous, minutely scabrid on the edges, carrying on the lower surface, alternately arranged, very flat pedicels which are truncate on the upper edge. *Spikelets* 3–3·25 mm. long, firmly compressed, winged on both glumes, unawned, with a short glabrous callus, 0·5 mm. long. *Lower glume* 2·5 mm. long, very narrowly oblong-acute, compressed, narrowly winged all along the keel, spreading widely at anthesis ; *upper glume* 3 mm. long, strongly compressed, broadly winged all along the keel, curved on the back to the tip, thin to hyaline on the margins, ciliate on the margins towards the tip, ciliate on the wing in the lower third. *Lower floret* empty ; *lemma* a hyaline, oblanceolate scale, 2 mm. long, ciliate on the margins at the tip ; *palea* absent. *Upper floret* ♀ ; *lemma* 2 mm. long, elliptic, emarginate, hyaline, glabrous, with a rudimentary awn from the notch or awnless ; *palea* absent ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 1 mm. long.

Ind. Or. : Ceylon, *Thwaites* C.P. 955 (typus in Herb. Kew.) ; Colombo, in fields, MacCrae s.n.

Hackel, in his monograph on the *Andropogoneae*, considered this specimen to be a variety of *Dimeria lehmannii* to which he gave the name β *mutica*. Hook. f., in the Flora of British India, on the same page not only made the same specimen a new species, *D. alata* Hook. f., but also followed Hackel in considering it to be a variety of *D. lehmannii*. He was obviously not quite certain of the status of this plant, for in Trimen's Flora of Ceylon, for which he worked up the grasses, we find *D. alata* Hook. f. reduced to the status of a synonym of *D. lehmannii*.

Actually it is a very good species differing from *D. lehmannii*, apart from its awnless condition, in the size of the spikelets, and by the important difference that both the glumes are winged. Indeed, this species is far closer to *D. bialata* C. E. C. Fischer but differs from that species by the smaller spikelets, papery, not corky wing, and the awnless condition—it is, moreover, much more robust and very different in appearance.

12. Dimeria ornithopoda *Trin.*, Fund. Agrost., 167 (1820), t. 14.

D. filiformis (Roxb.) Hochst. in Hohenack. Plant. Ind. Or. no. 231 nomen et ex Miq. in Verh. Nederl. Inst. 3, **4**, 35 (1851).

D. stipaeformis Miq., Prolus. Flor. Jap. 176 (1866) ?

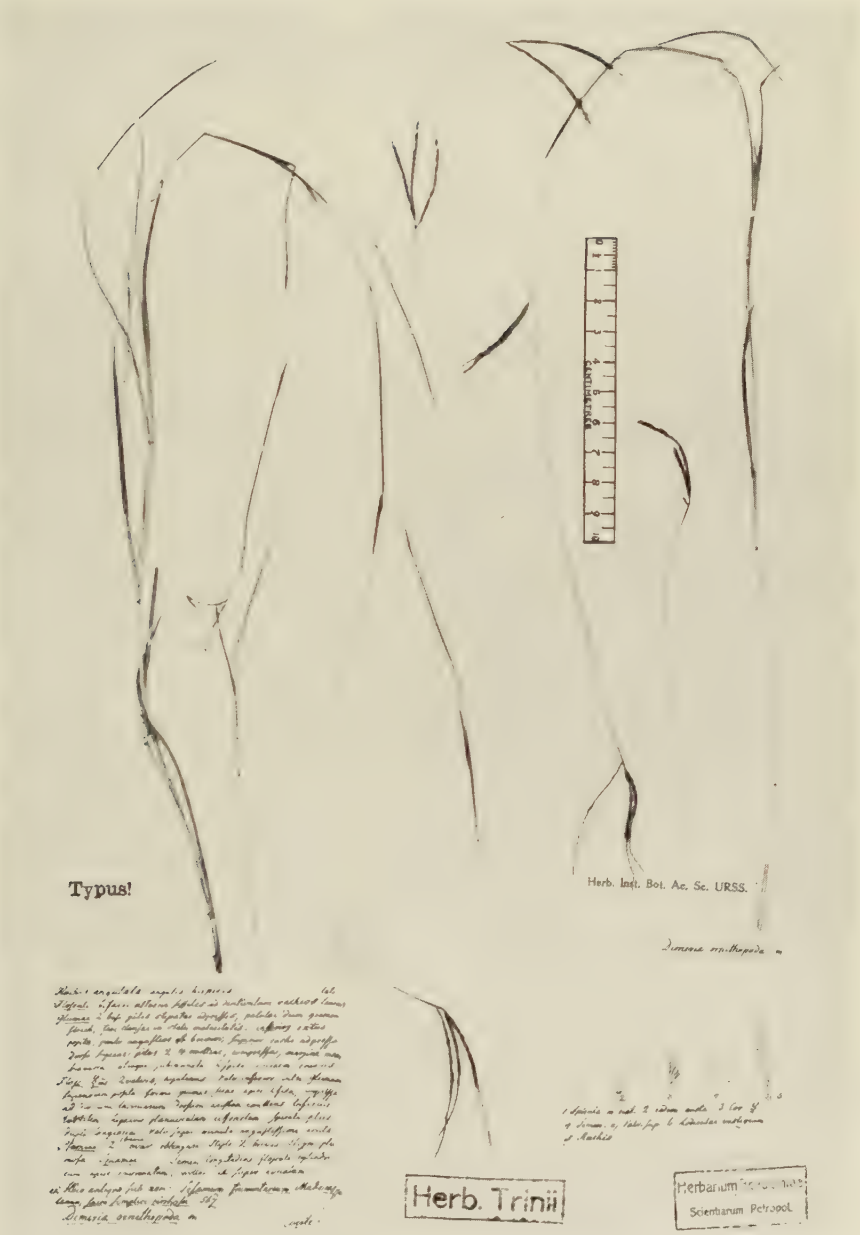
Andropogon filiformis Roxb., Flor. Ind. 260 (1820) non Pers.

A. roxburghianus Roem. et Schult. Mant. 2, 451 (1824).

Psilostachys filiformis Dalz. et Gibs., Bombay Flor. 305 (1861).

An annual grass. *Culms* extremely slender, almost capillary to fairly robust, smooth and glabrous, terete, bearded at the nodes, very leafy,

Plate 5.



Dimeria ornithopoda Trin. Photograph of the type sheet in the Herb. Inst. Bot. Ac. Sc.U.R.S.S., Leningrad.

To face page 572]

erect from the base, branched, 20–50 cm. tall. *Leaf-blades* linear-acuminate in shape, 2–4 cm. long, 1–2 mm. broad, with a very well marked mid-rib on the lower surface which is carried down on the sheath as a keel, covered on both surfaces with long (2–3 mm.) villous hairs which arise from tubercle-bases, being particularly marked on the mid-rib below and on the margins, or the hairs present in various densities to almost glabrous, minutely scabrid on both surfaces or somewhat coarsely scabrid on the upper surface, particularly towards the stout tip, erect, the lower spreading as they grow older ; *sheaths* strongly keeled from apex to base, often longer than the internodes, villous in the upper half with long hairs from tubercle-bases, villous on the lower half with similar hairs or entirely glabrous, shining, striate, hyaline on the margins, the lower loose and slipping from the culms, the upper tight and clasping, the uppermost spathelike, and provided with rudimentary blades ; *ligule* about 0·5 mm. long, membranous, lacerate, truncate or convex on the upper margin.

Inflorescence a pair of racemes, or sometimes three, at first appressed then divergent, often widely, terminating the tip of the culm and the branches ; rhachis of the racemes triangular in section, flat on one surface which is 0·25–0·3 mm. wide, not winged or narrowly winged, glabrous, minutely scabrid on the angles, furnished with alternately arranged very minute pedicels which are compressed and concave at the tip, glabrous. ***Spikelets*** (1) 2–3 (4·5) mm. long, strongly compressed, narrowly linear-oblong or slightly elliptic-oblong in shape. *Lower glume* 0·8–3 mm. long, linear acute in outline, much compressed, chartaceous in texture, hyaline on the margins, scabrid along the dorsal surface, shortly hairy on the sides ; *upper glume* 1–3·5 mm. long, strongly compressed but not keeled on the back, hyaline on the margins, chartaceous to coriaceous around the mid-nerve, coarsely scabrid along the dorsal surface, shortly hairy on the sides. *Lower floret* empty ; *lemma* a short hyaline scale about 0·5–1·5 mm. long ; *palea* absent. *Upper floret* ♀ ; *lemma* 0·8–1·8 mm. long, narrowly elliptic-acute, cleft at the tip into two short lobes, awned in the sinus ; *palea* absent ; *awn* 4–5 mm. long ; *column* chestnut-coloured 1·5 mm. long, twisted ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 0·25–0·5 mm. long.

The name *Dimeria ornithopoda* was first established by Trinius in *Fundamenta Agrostographiae*, a work which was published in Vienna in 1820. *Andropogon filiformis* Roxb. also appeared in the same year, when Carey brought out Roxburgh's *Flora indica* in Calcutta. *Andropogon filiformis* Roxb. is almost certainly the same plant as Trinius', and Hochstetter's combination *D. filiformis* (Roxb.) Hochst. has been accepted as the true name of this plant in Engler et Prantl, *Natür. Pflanzf.* **14e,** 109 (1940). Persoon, however, described an *Andropogon filiformis* in *Synopsis Plantarum* **1,** 103 (1805) and hence Roxburgh's name has no standing, being a later homonym. There is, therefore, no doubt that Trinius' name has priority and must stand.

Roxburgh's plant is not available, but the type sheet of Trinius' *Dimeria ornithopoda* was obtained for study through the kindness of the Director of the Leningrad Herbarium.

The type sheet tells us that *Dimeria ornithopoda* Trin. was found in an old herbarium under the name *Sesamum frumentaceum maderaspatanum*. We are

not told if the grass was mixed with a plant named as above, or if it had been mislaid in a cover of that name. At all events, we do know from Trinius' statement in *Fundamenta Agrostographiae* that the plant came from India and, from the name of the *Sesamum*, most likely from Madras.

Plate 5 shows the type sheet. Although the base is missing from each of the five specimens on the sheet, one is fairly safe in describing the plant as an annual. The label in the left-hand corner gives a complete diagnosis of the plant in Trinius' beautiful handwriting. In the other corner is another label showing dissections of the spikelet, and is again Trinius' own work. These sketches are beautifully executed and are reproduced with the addition of the sketch of an inflorescence in Trinius' *Fundamenta Agrostographiae*—the reproduction does scant justice to the delicacy of the original drawings.

The following is Trinius' diagnosis of *Dimeria ornithopoda* Trin.

Rhachis angulata angulis hispidis.

Flosculi bifarii alterni sessiles ad denticulum rhacheos lanceolati.

Glumae 2 basi pilis stipatae adpressis, patulae dum gramen floret ; fere clausae in statu maturitatis ; inferior extus posita, paulo angustior et brevior ; superior rachi adpressa dorso superne pilos 2–4 emittens, compressa, margine membranacea ; utraque subcarinata, hispida, coriacea, enervis.

Flosc. ♀ 2-valvis, hyalinus ; *valv. inferior* (intra glumam superiorem posita) forma glumae suae, apice 2-fida, compressa, ad divisum laciniarum dorsum aristam emittens inferius tortilem, superius planiusculam refractam, spicula plus duplo longiorem ; valv. super. *minuta* angustissime acuta. *Stamina* 2, brevia, ovar. oblongum. *Styli* 2, breves, *stigm.* plumosa. Squamae . . . . . Semen longitudine flosculi, cylindricum apice mucronatum, corollae valv. super. adnatum.

ex Hbio antiquo sub. nom : *Sesamum frumentaceum Maderaspatanum spica simplici cirrhosa* 567.

Dimeria ornithopoda m.

Vix dubium est quin hoc gramen pertiniat ad Dimeriam cl. Brownii quamvis numquam corollae neutrius ne vestigium quidem, detegere potuerim ; sed hoc manifeste vidi glumam angustiorem esse inferiorem corollamque hermaphroditam intra superiorem positam esse unde hoc gramen polygamum ; a corolla neutra adesse debet ! Stamina semper 2 observavi nec 3 ut vult cl. Brown.

A large sequence of sheets from India has been examined, comprising the collections at Dehra Dun and at Kew. The type sheet of *D. ornithopoda* Trin. has been seen and an authentically named sheet of *D. tenera* Trin. is also at Kew. From an examination of all this material, it is quite clear that *Dimeria ornithopoda* is a polymorphic species. In stature it varies from a few centimetres high to slender plants half a metre tall or more—it can be extremely hairy or almost completely glabrous—the spikelet length varies from 1–3·5 mm. long or occasionally slightly longer. The extremes look as different from one another as only distinct species can. The taxonomist, however, looking for specific differences runs into trouble at once when reliable characters are sought. Actually, there is a whole range of gradations in the characteristics named above, and the writer believes, for the present at least, that it is better to leave

matters where they are until a cytogenetical study of the genus can be carried out.

Perhaps the most distinct of all the forms of this plant is that growing upon Parasnath ; Clark's plant, 21084B, 33719A and 33719C. This plant has only, in so far as the writer is aware, been collected on two occasions, namely, by Clarke himself in 1873 and 1883. The two gatherings match one another exactly and are characterised by the extreme slenderness of the culms which are almost capillary and the very minute spikelets (1 mm. long) and anthers which are only 0·25 mm. long. The writer was tempted to describe this as new, and when more of it is known, it may well prove to be a new species which has arisen as a result of isolation in arid conditions on an isolated hilltop.

It would be advisable, however, to delay this step until further collections come to hand. It must possess exceptional powers of resistance to dessication and therefore possess a different constitution to, say, the race of *D. ornithopoda* which flourishes in Assam. It is to be hoped that some enterprising young (or old) Indian botanist will make it his business to ascend Parasnath and make a complete survey of the grass and other flora to be found there. When looking for the minute form of *D. ornithopoda*, a special search should be made for an *Arundinella* with the smallest spikelets seen in that genus, which is associated with Clarke's plant and occurs in both his collections. It has smaller spikelets than those in *A. pygmaea* and is almost certainly a new species.

From the rest of the material a distinct looking plant from the Khasi Hills is worthy of mention. This plant has very stiff racemes and spikelets which are 3·5 mm. long. This plant, also, seems to be a good species characterised by its large spikelets, larger anthers and very stiff, white, not reddish, racemes. This may also await a decision until some enterprising botanist collects it again.

As far as *D. ornithopoda* Trin. and *D. tenera* Trin. are concerned, the writer has come to the conclusion that these cannot be satisfactorily separated even as varieties, for there will always be a considerable number of specimens which could be placed in one or other of the species or lumped together as an intermediate group.

D. ornithopoda Trin. is a taller and more lax plant than *D. tenera* as known to Trinius ; the racemes are not stiff and the spikelets on the whole are slightly larger. Moreover, the variety *filiformis* Hack. based on Hohenacker's plant no. 231 from the neighbourhood of Mangalore, must also be reduced to *D. ornithopoda* var. *genuina*.

Hackel has another variety '*subrobusta*' to which he relegates Griffith's 6796. This sheet is at Kew and it in no way resembles a fragment of var. *subrobusta* which Hackel got from Japan. This fragment was obtained from Leiden where a collection of fragments of Hackel's types is to be found. I am grateful to Prof. Dr. Lam for making this specimen available. The upper glume of the spikelets of var. *subrobusta* is winged and the specimen definitely is not *D. ornithopoda*.

Having made a close study of the material from India available at Kew and at Dehra Dun, I am of the opinion that the collection of specimens which make up the *D. ornithopoda* complex, can be divided into the following varieties. It is possible, even probable, that these varieties will one day be regarded as valid species.

var. α **genuina** Hack.

Spiculae 1·5–2·5 mm. longae ; culmi ramosi ; antherae 0·5 mm. longae.

The limits of this variety are somewhat wider than Hackel's var. *genuina*. It includes his vars. *genuina, tenera* and *filiformis*.

var. β **khasiana** Bor var. nov.

Spiculae 3·5 mm. longae ; plantae humiles ; rhachis racemorum rigida ; racemi 2, divergentes ; antherae 0·75–0·8 mm. longae.

var. γ **gracillima** Bor var. nov.

Spiculae 1 mm. longae ; culmi tenuissimi ; antherae 0·25 mm. longae.

var. δ **megalantha** Bor var. nov.

Spiculae 2·5–3 mm. longae ; culmi 60 cm. alti, graciles ; antherae 1·5 mm. longae.

Distribution.

var. α **genuina**

Madras : Gudalur, Nilgiris, 1000 m., Nov. 1886, *J. S. Gamble* 18332 ; Pallode, Travancore, Nov. 1901, *Bourne* ; Tallyuppa, Mysore, 6–900 m., Oct. 1908, *Meebold* 10547 ; Wight 3086 ; Aglatti, Mysore, 1100 m., Nov. 1908, *Meebold* 10546 ; Calicut, 23 Oct. 1900, *Bourne* ; Bababudan Hills, April 1910, *Bourne*.

Burma : Tennaserim, *Helfer* ; Moulmyne, Jan. 1827, *Wallich* 8840 ; Mergui, *Griffith* ; *Kurz* 2727 ; Lower Burma 1938, *U Thein Lwin* 24—fairly common on poor soils ; Pegu. Irrawaddy and Sittang valley, *S. Kurz* 2728.

Khasi Hills : Mousmai, 1000 m., 8 Nov. 1873, *C. B. Clarke* 18474 ; Nunkhlao, 17 Oct. 1850, *Hook. f. et T. Thoms.* ; *Griffith* 6797 ; Sohra, 1300 m., 19 Oct. 1871 *C. B. Clarke* 15523 ; Upper Shillong, 2000 m., Aug. 1937, *N. L. Bor*.

Bihar : Chaibassa, 300 m., 20 Nov. 1883, *C. B. Clarke* 34350C ; Garpati Forest near Guntor, Sambalpur, 21 Oct. 1947, *H. F. Mooney* 2918 ; Bambiaburu, Nov. 1936, *J. S. Owden* 16.

Bengal : *Griffith*.

Nepal : *Wallich* 8839.

Madhya Pradesh : Chanda, 10 Nov. 1889, *Lowrie* 9929 ; Jashpur Statn., Sankiari, 900 m., 13 Nov. 1946, *H. F. Mooney* 2834—in open pasture land in valley ; Bailadila, Bastar State, 600 m., 5 Oct. 1940, *H. F. Mooney* 1412 ; Moharli Res., Chanda, 14 Dec. 1880, *J. F. Duthie* 9930.

Orissa : Kalahandi, summit of Tej Bandh Mali, 1200 m., 20 Dec. 1948, *H. F. Mooney* 3191 ; Khonda, 1889, *Dr. Walsh* ; near Kholgaon, Sambalpur, 26 Oct. 1947, *H. F. Mooney* 2922—growing on rock.

Naga Hills : Kohima, 1500 m., 13 Oct. 1942, *N. L. Bor* 17104.

Bombay : College of Science, Poona.

var. β **khasiana**

Assam : Khasi Hills, Cherra 1300 m., 6 Oct. 1867, *C. B. Clarke* 5625 ; ibidem, Mamloo, 1300 m., 24 Sept. 1886, *C. B. Clarke* 45095A ; ibidem, *Griffith* s.n.—*Dimeria fuscescens* ad viam Cherra.

var. γ **gracillima**

Bihar : Parasnath, 1300 m., 1 Oct. 1873, *C. B. Clarke* 21084B ; ibidem, 1400 m., 7 Oct. 1883, *C. B. Clarke* 33719A & C.

var. δ **megalantha**

Bombay : Belgaum, 25 May, 1914, no. 14. Not a very good fodder grass.

13. Dimeria connivens *Hack.* in DC., Monogr. Phan. **6,** 689 (1889).

An annual grass. *Culms* up to 25 cm. tall, shortly decumbent at the base, then erect, terete, smooth and glabrous, shortly bearded at the nodes. *Leaf-blades* 2·5 cm. long, 2 mm. broad, lanceolate- or linear-acute, mainly concentrated at the base of the plant, those of the upper culm-sheath usually rudimentary, glabrous on the lower surface, furnished with long, tubercle-based hairs on the upper surface at the base and particularly along the margins, minutely scabrid on both surfaces, coarsely scabrid towards and at the stout tip ; *sheaths* longer than the lower internodes, shorter than the upper, the latter tight, clasping, the former rather loose and slipping from the culms, keeled in the upper half, rounded below, broadly hyaline on the margins, smooth and glabrous, striate ; *ligule* a short ciliate membrane less than 1 mm. long.

Inflorescence of pairs of racemes, diverging slightly from one another, even when the spikelets are mature ; racemes 2 -4 cm. long ; axis of the racemes tough, continuous, flat or slightly convex on the upper surface, narrowly winged, ciliate on the margins of the wings, lower surface of the axis keeled, carrying alternately arranged very short, flat, obconic pedicels, concave on the upper margin. *Spikelets* 3·5 (4·5) mm. long, oblong, with a very short, bearded callus. *Lower glume* 3 mm. long, excluding the callus, much compressed, very narrow, ending above in a very sharp point, keeled above, rounded below, covered all along the back with forwardly directed cilia, thin on the margins ; *upper glume* 3·5 mm. long, elliptic-acute in shape if flattened, compressed, winged all along the keel, or the wing incomplete in some spikelets, ciliate for the whole length of the wing, the cilia much longer at the tip, very thin on the margins ; wing opaque, 0·25 mm. wide. *Lower floret* empty; *lemma* an oblong hyaline scale 1·5–2 mm. long, ciliate along the margins in the upper half ; *palea* absent. *Upper floret* ♀ ; *lemma* 2·5 mm. long, elliptic-acute in shape, hyaline, cleft at the tip into two short, acute lobes ; *palea* absent ; *awn* 9 mm. long ; *column* dark-coloured, twisted, 3 mm. long ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 0·6 mm. long ; *caryopsis* compressed, terete, linear, 2 mm. long ; *lodicules* 2, very minute, toothed ; *embryo* almost half the length of the grain.

Ind. Or. : Bihar, Ranchi, 600 m., 25 Oct. 1873, *C. B. Clarke* 20607A ; Rengali–Sambalpur, fire lines, Jan. 1917, *H. H. Haines* 5303. Orissa : Molyharan hill, 200 m., 30 Nov. 1947, *H. F. Mooney* 2981—abundant in

grassy glade in Sal forest ; Sambalpur, 200 m., 5 Sept. 1940, *H. F. Mooney* 1830—in compound on dry rocky hill ; Keonjhar State, Bhalidih, 1000 m., 3 Oct. 1940, *H. F. Mooney* 2794—in grassy glades and pasture ; Khariar, W. Sambalpur, 700 m., 29 Sept. 1940, *H. F. Mooney* 3658—rooting in crevices in bare quartzite on exposed upland at Sonabera ; Barapahar Hills, Lohra-Behera, 200 m., 20 Sept. 1940, *H. F. Mooney* 3610—growing semi-gregariously by roadside on comminuted shale (virtually no real soil) in a hot exposed position. (The specimens are 6–20 cm. tall, each with one very short raceme only—the spikelets are normal).

Portion of the type is at Kew and bears the following in Hackel's handwriting " mingled with other grasses collected (whereabout ??) by the collectors of the Calcutta Botan. Garden."

14. Dimeria deccanensis *Bor* sp. nov. cum *D. kurzii* Hook. f. comparanda sed ab ea racemis geminis haud singulis, antheris multo majoribus sed aristis multo brevioribus divergens.

Gramen annuum. *Culmi* usque 70 cm. alti, laeves, glabri, nodis barbati. *Foliorum laminae* perfectae basi gregatae, 3–6 cm. longae, 1·5–3 mm. latae, utrimque pilis albis e tuberculis ortis pilosissimae, utrimque scabrae ; *vaginae* superne pilosae, inferne glabrae, laxae ; *ligula* paene 1 mm. longa, truncata, membranacea, ciliata.

Racemi gemini (rarius singuli vel tres) ; racemi rhachis plana, 0·75 mm. lata, marginibus ciliata ; pedicelli brevissimi, explanati, in apicem concavum paulo attenuati. *Spiculae* 3·5 mm. longae, callo dense barbato. *Gluma inferior* 3·25 mm. longa, glabra vel lateribus villosa ; *gluma superior* 3·5 mm. longa, infra apicem minute alata. *Anthoecium inferius* vacuum ; *lemma* 1·5 mm. longum, oblanceolatum, hyalinum, ciliatum ; *palea* nulla. *Anthoecium superius* ♀ ; *lemma* hyalinum, elliptico-acutum, apice bifidum, e sinu aristatum ; *palea* nulla ; arista 8 mm. longa ; *columna* 3 mm. longa, torta ; styli 2 ; stigmata plumosa ; stamina 2 ; antherae 1·5 mm. longae.

Dimeria deccanensis *Bor.*

An annual grass. *Culms* up to 70 cm. tall, erect or slightly decumbent at the base, terete, smooth and glabrous, not at all leafy, bearded at the nodes. *Leaf-blades* almost all collected at the base of the culms, those of culm-sheaths, especially the upper ones, much reduced, almost rudimentary, linear-acuminate in shape (sometimes longer than the basal but rarely so), up to 5 cm. long, 2·5 mm. wide, covered with sparse tubercle-based hairs, particularly below on the mid-rib, which is prominent on the under surface and carried down on the sheath as a keel, decorated on the margins with well-spaced tubercle-based hairs, those from the lower sheaths 3–6 cm. long, 1·5–3 mm. broad, very hairy on the upper and lower surfaces with bulbous-based hairs, all scabrid on both surfaces ; *sheaths* much shorter than the internodes in the upper half of the culms, much longer than the basal internodes, usually rounded and glabrous on the lower half, hairy with tubercle-based hairs above, rather loose and slipping from the culm at the base, tighter higher up ; *ligule* less than 1 mm. long, truncate,membranous, ciliate.

Inflorescence of two, rarely one or three, racemes 4–7 cm. long, seated at the tip of the long exserted peduncle ; rhachis of the raceme flat on the back, ciliate along the margins, almost 0·75 mm. broad, keeled in zig-zag fashion on the lower surface, glabrous, furnished with alternately arranged pedicels which are extremely short with wide bases tapering to a narrow concave tip which is surrounded with a well-marked lip. *Spikelets* 3·5 mm. long, much compressed, with a callus 0·5 mm. long ; callus densely bearded below. *Lower glume* 3·25 mm. long, oblong-acute if flattened, strongly compressed, hyaline along the margins, chartaceous on the keel, ciliate along the keel in the lower two-thirds, scabrid above, often scabrid along the sides, particularly towards the tip, occasionally villous on the sides ; *upper glume* 3·5 mm. long, firmly compressed, hyaline on the sides and margins, densely ciliate along the back and most minutely winged at the tip, straight or very slightly curved on the back. *Lower floret* empty ; *lemma* 1·5 mm. long, oblanceolate in shape, very delicate in texture, ciliate on the margins in the upper half ; *palea* absent. *Upper floret* ♀ ; *lemma* 1·5–2 mm. long, hyaline, elliptic-acute in shape, cleft at the apex and awned in the sinus ; *palea* absent ; *awn* 8 mm. long ; *column* dark-coloured, 3 mm. long ; styles 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 1·5 mm. long.

Ind. Or. : Madras State. Pilicode. S. Kanara, 11 Nov. 1917, 15340 ex Madras Herb. (typus in Herb. Kew.) ; Nileshwar, S. Kanara, 9 Nov. 1917, 15320 ex Madras Herb.

This species bears some resemblance to *D. kurzii* but it has much larger anthers than that species and the awns are very much shorter.

15. Dimeria orissae *Bor*, sp. nov. *D. conniventi* Hack. et *D. deccanensi* Bor similis sed ab illa gluma superiore infra apicem late nec per totum decursum alata, ab hac antheris minoribus, statura humiliore distinguenda.

Gramen annuum. *Culmi* graciles, erecti, usque 22 cm. alti, laeves, nodis glabri. *Foliorum laminae* lineares, acuminatae, 3–7 cm. longae, 2–3 mm. latae, utrimque scabrae, marginibus sparse pilis e tuberculis ortis ciliatae ; *vaginae* arcte complectentes, superne carinatae, inferne rotundatae, laeves, glabrae ; *ligula* membranacea, lacerata, 0·5 mm. longa.

Racemi in culmorum apicibus gemini, 3–5·5 cm. longi, divergentes ; rhachis late alata, 1·25 mm. lata ; pedicelli breves. *Spiculae* 4 4·25 mm. longae, oblongae. *Gluma* inferior 3 mm. longa, callo 0·25 mm. longo, carinata haud alata, dorso scabra ; *gluma superior* 4 mm. longa, compressa, infra apicem late vel anguste alata, dorso scabra, apice pilis nonnullis. *Anthoecium inferius* vacuum ; *lemma* hyalinum, 2 mm. longum ; *palea* nulla. *Anthoecium superius* ♀ ; *lemma* 2 mm. longum, elliptico-acutum, hyalinum, apice bifidum, aristatum ; *palea* nulla; *arista* 10 mm. longa ; *columna* castanea, torta, 4 mm. longa ; *styli* 2 ; *stigmata* plumosa ; *stamina* 2 ; *antherae* 0·5 mm. longae.

Dimeria orissae *Bor.*

An annual grass. *Culms* slender, unbranched, up to 22 cm. tall, terete, smooth and glabrous, closely invested with the sheaths, glabrous at the

nodes. *Leaf-blades* linear-acuminate in shape, 3–7 cm. long, 2–3 mm. wide, not or hardly contracted to the sheath, erect not spreading, with a very conspicuous mid-rib above, which is prominent below and carried down the sheath as a keel, somewhat glaucous on the lower surface, furnished on the margins with tubercle-based hairs which are sometimes found on the upper surface towards its base, scabrid on both surfaces, minutely on the lower, more coarsely on the upper, particularly so at the stout tip ; *sheaths* rather tight and clasping the culms, keeled in the upper half, rounded below, glabrous and smooth, striate, the upper spathelike with reduced blades ; *ligule* a short lacerate membrane, 0·5 mm. long.

Inflorescence of two racemes terminating the culms ; racemes 3–5·5 cm. long, pressed together at first then slightly divergent, consisting of a broadly winged rhachis, 1·25 mm. wide, carrying shortly pedicelled spikelets on its lower surface ; pedicels marginal, concealed from above, about 0·5 mm. long, truncate-cuneate ; rhachis straight or slightly zig-zag, manifestly winged, flat on the upper surface, scabrid on the margins. *Spikelets* 4–4·25 mm. long, firmly compressed, oblong in outline, awned, not winged. *Lower glume* 3 mm. long, seated on a shortly bearded callus, 0·25 mm. long, linear-acute in shape if flattened, straight on the back, firmly compressed, very shortly hyaline on the sides, of firmer texture in the centre, scabrid on the keel from tip to base and with a few hairs near the tip ; *upper glume* 4 mm. long, strongly compressed, hyaline on the margins, firmer about the mid-nerve, strongly keeled almost all along the back, scabrid on the keel, flat on the back until within a short distance of the tip, when the keel curves forward to an acute point, not winged on the keel but narrowly winged on the curved portion at the tip, scabrid on the back, and with a few longish hairs on the sides at the tip. *Lower floret* empty ; *lemma* a very small hyaline scale 2 mm. long, oblanceolate-acute, ciliate on the margins above ; *palea* absent ; *upper floret* ♀ ; *lemma* 2 mm. long, elliptic-acute, hyaline, cleft at the tip into two short lobes, awned in the sinus ; *palea* absent ; *awn* 10 mm. long ; *column* chestnut-brown, twisted, 4 mm. long ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 0·5 mm. long.

Ind. Or. : Orissa, Pipokhuri, Keonjhar State, 1000 m., 1 Oct. 1946, *H. F. Mooney* 2758 (typus in Herb. Kew.)—in Sal forest under shade ; above Nelpada, near Pottangi, Koraput Dist., 8 Oct. 1950, 1300 m., *H. F. Mooney* 4039—sub-gregarious on very thin soil over granite-gneiss on Malakottə Parbat ; Laxmipur, Koraput Dist., 24 Oct. 1950, 1200 m., *H. F. Mooney* 4212—in shallow grassy depression on laterite plateau.

This species is close to *D. connivens* Hack. but lacks the broad wing to the upper glume of that species, the glume bearing a conspicuous wing just at the tip only. It also is close to *D. deccanensis* Bor, but it has much smaller anthers, is small in stature, but has a larger wing below the tip of the upper glume.

16. Dimeria pubescens *Hack.* in DC., Monogr. Phan. **6,** 83 (1889).

An annual grass. *Culms* up to 27 cm. tall, terete, smooth and glabrous save at the bearded nodes, branching at the nodes with all branches ending in an inflorescence. *Leaf-blades* linear-acute, up to 6 cm. long,

Plate 6.

Photograph of a sheet from Hackel's herbarium in Herb. Mus. Palat. Vindob., showing centre, the lectotype of *D. pubescens* Hack. The specimen on the left of the sheet is *D. trimenii Hook.* f.

To face page 580]

5 mm. wide, ascending, rather stiff, dark green above, lighter green below, covered on both surfaces with sparse, long, whitish hairs from tubercle-bases, with a broad mid-rib on the upper surface which is also well-marked below, minutely scabrid on both surfaces and also on the margins, blades of the uppermost sheaths rudimentary ; *sheaths* keeled on the dorsal surface, tight, striate, covered with sparse hairs from tubercle-bases, or glabrous in the lower half, upper sheaths spathe-like, without a blade ; ligules 1·5 mm. long, membranous, ciliate on the upper margin.

Inflorescence of two racemes (rarely one) 5–6 cm. long, slightly divaricate, each consisting of two rows of spikelets seated on pedicels on the under surface of a straight or zigzag flat rhachis 1·25 mm. wide, with a marked intramarginal line, markedly convex below, winged, ciliate on the margins ; pedicels short, cuneate, concave at the tip. *Spikelets* 5–6 mm. long, firmly compressed, gaping widely at anthesis. *Lower glume* 4·5 mm. long, compressed, almost keeled, oblong acute or sometimes the tip prolonged into a short mucro, narrowly winged just below the tip, ciliate all along the back, then on the margins ; *upper glume* 5 mm. long, 2·5 mm. wide when flattened, broadly winged from tip to base, or sometimes the wing much narrowed towards the base, ciliate the whole length of the wing and with 3–4 long hairs at the tip. *Lower floret* empty ; *lemma* a hyaline scale, lanceolate-acute in shape, 3·5 mm. long ; *palea* absent. *Upper floret* ♀ ; *lemma* hyaline, 3 mm. long, bifid at the tip, awned ; *palea* very small, quadrate, hyaline ; *awn* about 10 mm. long ; *column* chestnut coloured, 1·5–2 mm. long, twisted ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 1 mm.–2 mm. long ; *lodicules* 2, cuneate, toothed.

CEYLON : *Thwaites* C.P. 956 in part (Typus in Herb. Mus. Palat. Vindob.).

The type sheet of *D. pubescens* Hack., 34782 Herb. Vindob., preserved in Vienna, has been seen. The accompanying plate shows the material upon which Hackel based this species. Occupying the centre of the sheet is a complete specimen of a robust annual grass with several stems each ending in an inflorescence which consists of two racemes. The spikelets in these racemes are broadly winged on the dorsal surface of the upper glume from base to apex. On the left-hand side of the sheet is another specimen which does not possess a base but consists of two flowering culms only, each of which ends in a single raceme. The spikelets in these racemes are not winged all along the dorsal surface of the upper glume.

Apart from the feature of the single raceme, the left-hand specimen on Hackel's sheet corresponds in every way to the type sheet of *Dimeria trimenii* Hook. f. which is at Kew. We are therefore left with the single complete specimens on the sheet which must be taken as the type specimen of *D. pubescens* Hack. Hackel drew up his description of the species from both the specimens on the sheet, for he says, with reference to the upper glume " carina infra apicem vel rarius per totum decursum alato-marginata ". The first part of this description refers to the specimen of *D. trimenii* on the left-hand side of the Vienna sheet, and it would have been better if Hackel had left the word ' rarius ' out of his description, for there are far more spikelets on the sheet with an entire wing to the upper glume than spikelets with a small wing.

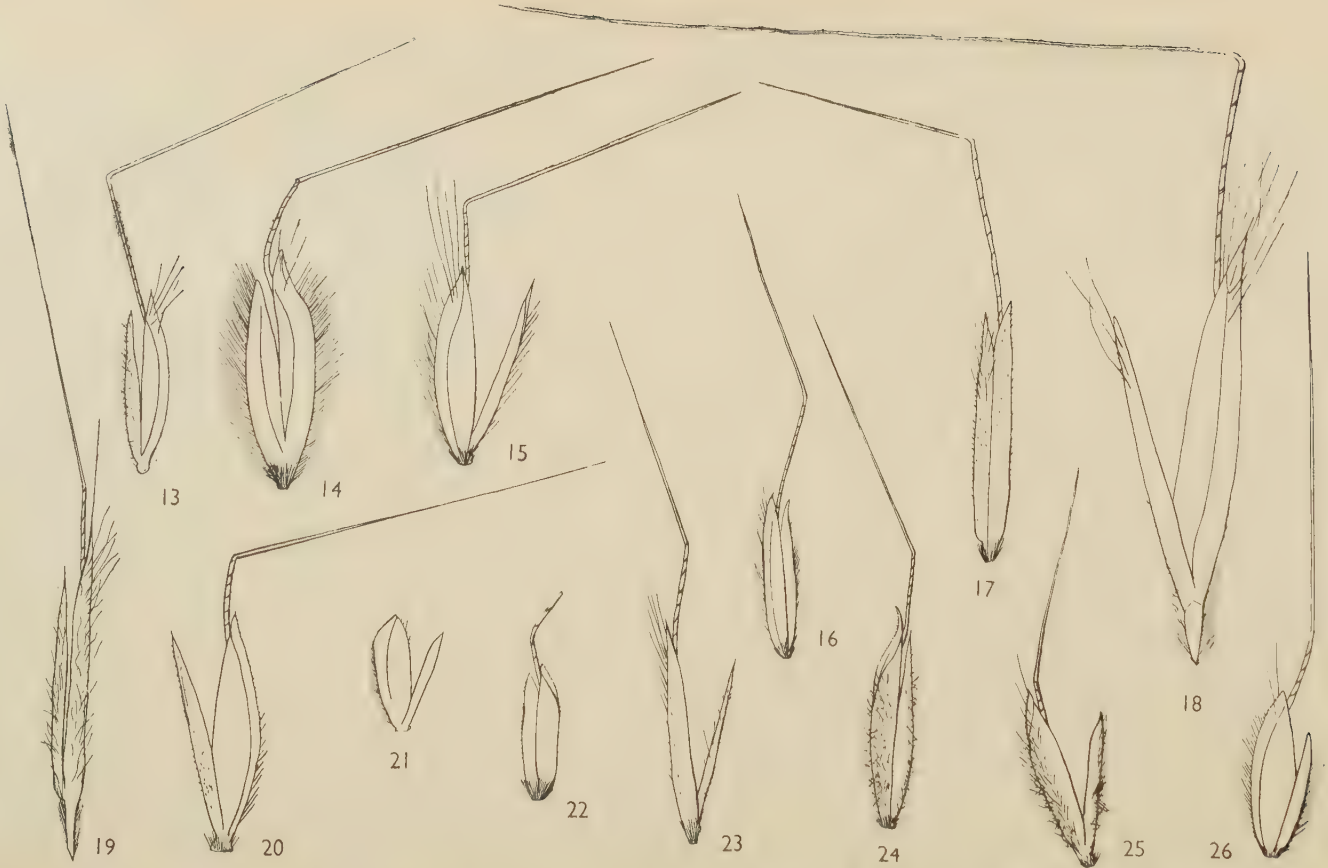


Fig. 2. Spikelet-silhouettes : 13. *D. stapfiana* C. E. Hubbard : 14. *D. mooneyi* Raiz. : 15. *D. pubescens* Hack. : 16. *D. connivens* Hack. : 17. *D. velutina* Bor : 18. *D. blatteri* Bor : 19. *D. acutipes* Bor : 20. *D. fuscescens* Trin. : 21. *D. alata* Hook. f. : 22. *D. woodrowii* Stapf : 23. *D. hohenackeri* Hochst. : 24. *D. ceylanica* Bor : 25. *D. trimenii* Hook. f. : 26. *D. lehmannii* (Nees) Hack. All × 5.

17. Dimeria blatteri *Bor* in Kew Bull. **1949,** 70 (1949).

An annual grass. *Culms* up to 60 cm. tall, terete, smooth and glabrous, shining, erect from the base, bearded at the nodes. *Leaf-blades* linear-acuminate in shape, up to 15 cm. long, 4 mm. broad, covered on both surfaces with long, white hairs from tubercle-bases, these hairs being very prominent on the margins and on the mid-rib which is well marked below and carried down on the sheath as a keel, minutely scabrid on both surfaces and on the margins, particularly so towards the very stout tip, rather flaccid ; *sheaths* somewhat loose, shorter than the internodes, slipping from the culms, keeled in the upper half, rounded on the back below, smooth and glabrous, shiny in the lower half, pilose with tubercle-based hairs in the upper half ; *ligule* about 1·5 mm. long, membranous, truncate, ciliate on the upper margin.

Inflorescence of 3–4 racemes of spikelets seated at the tip of the peduncles ; rhachis of the racemes 4–8 cm. long, slender, terete or angled, smooth and glabrous ; *pedicels* alternate, 1–1·5 mm. long, shortly bearded at the oblique tip. *Spikelets*, including the callus, 1·2 mm. long, 8–12 mm. long, strongly compressed, linear-oblong in outline, or gaping at anthesis. *Lower glume* 6–8 mm. long, straight on the back or slightly recurved, densely covered with caducous hairs on the lower fifth to third, thin on the margins but rather tough about the mid-nerve ; *upper glume* 8–12 cm. long, rounded on the back which is corky, thin to hyaline on the margins, with the sides firmly pressed together, produced at the tip as a very short awn, more or less broadly winged at the tip, densely ciliate on the dorsal surface at the base, less densely to almost glabrous towards the tip which is furnished on each side with two or three long hairs ; hairs caducous. *Lower floret* empty ; *lemma* oblanceolate in shape about 6 mm. long, ciliate on the margins in the upper third ; *palea* absent. *Upper floret* ♀ ; *lemma* about 8 mm. long, elliptic-acute in shape, hyaline, cleft at the top into two lobes 2 mm. long, awned on the sinus ; *palea* absent ; *awn* 28 mm. long ; *column* 8 mm. long, chestnut brown in colour, twisted ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 3·5 mm. long.

Ind. Or. : Bombay State, Khandala, Echo Point, Oct. 1918, Blatter et McCann (typus in Herb. Blatter, St. Xavier's College, Bombay) ; near Lonavla, W. Ghats, 1 Oct. 1898, *Woodrow*.

This species and the next *D. stapfiana* C. E. Hubb. are very close to one another, in fact, *D. blatteri* looks like a giant specimen of *D. stapfiana*. There are, however, differences in the spikelet. The upper glume in *D. blatteri* is extremely attenuate and is compressed into a somewhat broad wing at the tip of the glume. This wing is conspicuously veined with green veins. More collections of the species are needed, and if *D. stapfiana* C. E. Hubbard turns out to be as plastic a species as *D. ornithipoda* has been shown to be, it is quite possible that *D. blatteri* Bor will have to be reduced to *D. stapfiana*.

18. Dimeria stapfiana *C. E. Hubbard ex Pilger* in Engl. et Prantl, die Natür. Pflanzf. 14e, 109 (1940).
Dimeria diandra (Stapf) Stapf ex Bhide in Journ. & Proc. Asiat. Soc. Bengal, n.s. 7, 517 (1911) non Griff.
Woodrowia diandra Stapf in Hook. Ic. Pl. sub tab. 2447 (1896).

An annual grass. *Culms* up to 45 cm. tall, many to few at the base,

slender, smooth and glabrous, shining, erect not decumbent, branching sparsely, densely bearded at the nodes. *Leaf-blades* 3–7 cm. long, 2–5 mm. broad, those at the base much longer and broader than those on the culm sheaths, linear-acute in shape with a very stout tip, rounded at the base, covered on both surfaces with long white hairs from bulbous bases, or glabrescent on the lower surface, ciliate on the margins with similar hairs, scabrid on both surfaces and on the margins ; *sheaths* rather loose, rounded below, sharply keeled above, striate, smooth, shining and glabrous in the lower two thirds, pilose in the upper third with bulbous-based hairs from the grooves between the striations, those of the upper nodes with rudimentary blades ; *ligule* membranous, about 1 mm. long, opaque, lacerate and ciliate on the upper margin.

Inflorescence of 4–7 digitate racemes terminating the culms ; racemes up to 10 cm. long, rather loosely spiculate, consisting of a glabrous, filiform, terete or angled, tough rhachis upon which are pedicelled spikelets, alternately arranged ; pedicels 0·5–2 mm. long, terete below, expanded into a cup above, glabrous. *Spikelets* 4–7 mm. long, with a well marked callus 0·5 mm. long, strongly compressed ; often spreading at right angles to the rhachis ; callus obconical very densely bearded. *Lower glume* 4–6 mm. long, oblong-obtuse in shape, very narrow, straight on the back, compressed, rounded on the coriaceous back, thin to hyaline at the sides, covered on the back with dense white, short hairs, smooth and glabrous on the sides but scabrid on the sides towards the tip ; *upper glume* 5–7 mm. long, 1·6 mm. wide, very strongly compressed, keeled, with the keel sometimes corky, hyaline on the margins to coriaceous at the keel, winged in the upper third, garnished with a few long hairs on each side of the scabrid wing at the tip. *Lower floret* empty ; lemma an oblanceolate hyaline scale, ciliate on the margins above, 2 mm. long ; *palea* absent. *Upper floret* ♀ ; *lemma* elliptic, 3 mm. long, cleft at the apex into two lobes, awned on the sinus, hyaline, glabrous ; *palea* absent ; *awn* 14 mm. long, the lower 5 mm. constituting the dark coloured twisted column ; *styles* 2, short ; *stigmas* plumose ; *stamens* 2 ; *anthers* 2·5–3 mm. long ; *lodicules* 2, small.

Ind. Or. : Bombay State, Poona Dist., Mawal, *Woodrow* (type of *Woodrowia diandra* Stapf in Herb. Kew.) ; Khandala, Tata's Lake, Oct. 1918, *C. McCann* A317 ; Blatter & McCann mention several other localities in Bombay State.

According to Blatter & McCann a grass of open grassland where it is gregarious in often large formations.

It is somewhat variable, particularly in regard to the size of the spikelets, in which connection the remarks under *D. blatteri* Bor may be seen. One peculiar feature is mentioned by Stapf. This is the texture of the keel of the upper glume which may vary from slightly coriaceous to thick and spongy. Only observation in the field can decide whether this is due to the age of the spikelet or to some other factor.

19. Dimeria ballardii *Bor* stat nov.

D. fuscescens Trin. var. β *zeylanica* Hack. in DC., Monogr. Phan. 6, 85 (1889), a *D. fuscescente* Trin. racemis duobus haud tribus, glumis superioribus late haud anguste alatis, foliorum laminis vaginisque, culmorum inferiore tertia parte gregatis, distincta.

Dimeria ballardii *Bor.*

A perennial grass. *Culms* up to 50 cm. tall, with many short internodes at the base, terminating in two much longer internodes, smooth and glabrous, terete, shortly bearded at the nodes, prostrate at the base or erect, or sometimes apparently deeply rooted. *Leaf-blades* all collected in the lower third or quarter, erect not spreading, linear-acute in shape, 3–10 cm. long, 2–5 mm. broad, not contracted at the base to the sheath, gradually tapering to the stout tip, more or less glabrous when old, when young covered on both surfaces or on the upper only with longish (2 mm.) white tubercle-based hairs, very minutely scabrid on both surfaces and on the margins, with a mid-rib which is very prominent below and carried down as a keel on the upper part of the sheath ; *sheaths* overlapping on the lower portion, congested, shorter than the internodes above, usually smooth and glabrous, or when young covered with tubercle-based hairs on the upper half, those on the upper part of the culms without blades or carrying a rudimentary blade only ; *ligule* membranous 0·5–1 mm. long, convex above, lacerate.

Inflorescence of two widely diverging, stout, fuscous racemes 4–7 cm. long ; rhachis stout, flat on the back, 0·6–0·7 mm. wide, straight or slightly zig-zag, with an intramarginal depression, smooth and glabrous above, keeled below, less often convex with pedicels arranged alternately on each side of the under surface, usually 1–1·5 mm., exceptionally up to 3 mm. long, obconical in shape, truncate above, somewhat flattened below, smooth and glabrous. *Spikelets* 6 mm. long (including a callus 0·5 mm. long), firmly compressed, dark chestnut-brown or fuscous in colour, awned ; callus bearded on the lower margin. *Lower glume* 5·5 mm. oblong-acute if flattened, coriaceous in texture, firmly compressed, not hyaline on the margins, keeled, very narrowly winged on the keel in the upper third, scabrid on the keel, straight on the back ; *upper glume* elliptic-acute if flattened, firmly compressed, strongly keeled, with a thick coriaceous, scabrid wing all along the keel, curved on the back, with hyaline ciliate margins. *Lower floret* empty ; lemma 3·5 mm. long, a narrow, oblanceolate, acute, hyaline scale, ciliate on the margins in the upper half. *Upper floret* ♀ ; *lemma* 4 mm. long, oblong-acute, split at the apex into 2 stout triangular lobes, smooth and glabrous, hyaline, awned in the sinus ; *palea* absent ; *awn* 7–9 mm. long, kneed ; *column* chestnut-brown in colour, 3·5 mm. long ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 2·5 mm. long ; *grain* fusiform, 3 mm. long, laterally compressed ; embryo 1 mm. long ; hilum basal, linear-punctiform.

Ind. Or. : Ceylon ; Kudu Oya on Ramboda Road, 28 Dec. 1950, 1700–1750 m., *F. Ballard* 1290 ; on open ground (holotype in Herb. Kew.) ; Gardner 1028 ; N. Ellia, Dec. 1866, *Thwaites* 3256.

This species is closely allied to *Dimeria fuscescens*, whose home is principally in Assam, although it does occur in other places in northern India. In fact, in Hackel's treatment of the genus in DC., *Monogr. Phan.* **6,** 85 (1889) he considered it to be merely a variety of *D. fuscescens* Trin. to which he gave the name var. β *zeylanica.* The differences between the two species are striking when taken together. The telescoping of the internodes of *Dimeria ballardii* at the base of the plant which results in the leaves and sheaths being closely crowded in the lower

third, gives the plant a very different aspect. The upper glume is broadly instead of narrowly winged, and the wing is of a much firmer and coarser texture. The two (not three) racemes diverge widely at anthesis. Added to all this, the restricted distribution of *D. ballardii Bor* at high elevations in Ceylon, where it has doubtless been isolated for many years, strengthens the opinion that *D. fuscescens* Trin. and *D. ballardii* are specifically distinct.

20. Dimeria fuscescens *Trin.* in Mém. Acad. Petersb. sér. 6, **2,** 335 (1832).

A perennial grass, often robust. *Culms* up to 70 cm. tall, erect from the base, usually very short-noded at the base so that the basal leaves are very crowded, internodes getting longer towards the top, terete, smooth and glabrous, shortly bearded at the nodes. *Leaf-blades* erect, not spreading, linear-acuminate, the lower well developed, 4–15 cm. long, 2–4 mm. broad, covered on both surfaces with a mat of white hairs from tubercle-bases, minutely scabrid on the surface and on the margins, particularly so towards the long-drawn-out stout tip, with a very prominent mid-rib on the lower surface which is carried down on the sheath as a keel, the upper lemma more or less reduced or rudimentary ; *sheaths* overlapping below and slipping from the culms, the upper tighter, all smooth and glabrous or more or less covered with a mat of tubercle-based hairs, keeled ; *ligule* a short membrane, ciliate on the truncate edge.

Inflorescence of 3 (seldom 2) digitately arranged racemes, at the tip of the long-exserted peduncles ; racemes 4–12 cm. long, diverging from one another at anthesis; rhachis flat or slightly convex on the upper surface, very narrowly winged, straight or slightly zig-zag, scabrid on the margins, rounded on the lower surface, carrying, alternately arranged, rather stout pedicels, compressed but not flattened, concave above, glabrous. *Spikelets* 4·5–5 mm. long, firmly compressed, closely appressed to the rhachis, with the lower glume widely spreading at anthesis, with a callus 0·5 mm. long, bearded on the lower edge. *Lower glume* 5 mm. long, linear-oblong-acuminate, straight on the back, much compressed, keeled at the tip, without a wing or with the narrowest of wings, scabrid all along the back and often ciliate as well ; *upper glume* 5 mm. long, 2 mm. wide when flattened, very firmly compressed, oblong-elliptic-acute when flattened, very thin on the margins, narrowly winged all along the back, scabrid on the keel and very often also ciliate. *Lower floret* empty ; *lemma* an oblanceolate hyaline scale, 3-nerved, acute at the apex , ciliate in the upper half ; *palea* absent. *Upper floret* ♀ ; *lemma* 3 mm. long, narrowly elliptic in shape, shortly 2-lobed at the apex, hyaline ; *palea* absent ; *awn* issuing from the cleft, 12–14 mm. long ; *column* 3 mm. long, dark coloured, twisted ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 2·5–3 mm. long.

Ind. Or. : Nepalia, *Wallich* 8841 (type number at Kew) ; Khasi Hills, Cherra, 14 Aug. 1850, *Hook. f. et T. Thom.* ; ibidem, Sohra, 12 Oct. 1872, *C. B. Clarke* 17464D ; ibidem, Myrang, 1600 m., 10 Sept. 1886, *C. B. Clarke* 45723A ; Mawphlang, 1600 m., 7 Sept. 1943, *N. L. Bor* 17934 ; in swamps ; Sylhet, *Hook. f. et T. Thom.* ; Manipur State, Ninthoukhong 600 m., 16 Nov. 1944 *N. L. Bor* 18140 ; Bastar State, Bailadila, 1000 m., 9 Oct. 1940, *H. F. Mooney* 1533.

21. Dimeria lehmannii (*Nees*) *Hack.* in DC., Monogr. Phan. 6, 82 (1889).

Pterygostachyum lehmanii Nees ex Steud. Syn. Pl. Glum. 413 (1855).

A perennial grass. *Culms* up to 60 cm. tall, terete, smooth and glabrous, erect from the base, simple, rarely branching, bearded at the nodes. *Leaf-blades* acuminate in shape, hardly rounded, or only slightly, at the base to the sheath, 4–15 cm. long, 2–4 mm. wide, minutely scabrid on both surfaces and on the revolute margins particularly towards the tip, garnished on the upper surface towards the insertion with sparse tubercle-based hairs either on the margins or just inside, erect, not spreading, stiff, with a well-marked prominent mid-rib on the lower surface which is carried down on the sheath as a keel ; *sheaths* of the upper part of the culm tight and wrapped around the culm, those of the lower part loose and slipping from the culm, the latter markedly keeled on the upper half or third, round on the back in the lower half, smooth and glabrous, striate ; *ligule* a membrane, lacerate and ciliate on the upper truncate margin, 0·6–1 mm. long.

Inflorescence of two, rarely three, divergent racemes, 4–8 cm. long ; rhachis of the racemes tough, continuous, flat on the back, 0·6–0·7 mm. wide, straight or zig-zag, ciliate on the margins, convex and keeled on the face, very narrowly winged, furnished on the face with flat pedicels half as broad as the rhachis, concave above, ciliate on the outer margin. *Spikelets* 4–4·5 mm. long, firmly compressed, with a short callus 0·4 mm. long, lying closely appressed to the rhachis. *Lower glume* 3–3·6 mm. long, linear-acute, straight on the back but curved just at the tip, strongly compressed, keeled at the tip, rounded on the dorsal surface lower down, scabrid on the keel, hairy or ciliate on the dorsal surface ; *upper glume* very firmly compressed, 4–4·5 mm. long, winged all along the dorsal surface, ciliate on the wing and scabrid towards the tip, oblanceolate-acute if flattened, more or less straight on the back, then curved towards the tip, almost hyaline on the margins. *Lower floret* empty ; *lemma* a hyaline oblong scale 2 mm. long, ciliate on the margins towards the tip ; *palea* absent. *Upper floret* ♀ ; *lemma* elliptic-acute, hyaline, cleft at the tip into two acute lobes, 3 mm. long ; *palea* a minute hyaline scale (?) or absent ; *awn* from the sinus, perfect, 14·5 mm. long ; *column* dark chestnut, twisted, 3·5 mm. long ; *styles* 2 ; *stigmas* plumose ; *stamens* 2 ; *anthers* 1–1·5 mm. long ; *grain* compressed, nearly 3 mm. long.

Ind. Or. : Ceylon ; *Thwaites* 952 (typus in Herb. Kew.). Madras State ; Base of Kambakkam Hills, Chingleput Distr., 16 Mar. 1901, *Bourne* 2289.

22. Dimeria trimenii *Hook. f.* in Trimen, Handb. Flor. Ceyl. **5,** 198 (1900).

A perennial grass. *Culms* stout, erect from the base, profusely branched, up to 80 cm. tall, mostly covered by the sheaths, smooth and glabrous below the inflorescence, terete, shaggy at the nodes, often shaggy below the nodes in the lower part of the culm. *Leaf-blades* linear-acuminate in shape, up to 15 cm. long, 5 mm. broad, erect not spreading, somewhat stiff, covered on both surfaces with long villae from tubercle-bases, with a mid-rib, flat above, prominent below and carried down on the sheath as a keel, minutely to coarsely scabrid on both

surfaces, coarsely scabrid on the pungent tip, contracted insensibly to the sheath ; *sheaths* tight clasping the culms, longer than the internodes, striate, covered for the whole of their length with a shaggy pubescence which for the most part consists of long, white hairs from tubercle bases, the uppermost sheaths carrying reduced blades ; *ligule* 0·5–1 mm. long, truncate or rounded above, membranous.

Inflorescences of twin racemes (rarely solitary) 6·5 cm. long, terminating the culm and its branches ; peduncle usually long-exserted, smooth and glabrous ; rhachis of the racemes flat on the back, 1–1·5 mm. wide, undulate or markedly zig-zag, winged and very thickly pilose on the margins, convex on the under surface, provided with cuneate pedicels, concave on the upper margin, glabrous save for a few long hairs on the upper margin. *Spikelets* 4·5 mm. long, including the bearded callus 0·5 mm. long, oblong-acute in shape, firmly compressed, very hairy. *Lower glume* 3·5 mm. long, narrowly oblong-acute in profile, compressed, straight on the back, very densely hairy on the dorsal surface from base to apex, less so on the sides, very narrowly winged at the keeled tip, thin on the margins ; *upper glume* 4 mm. long, straight on the back to within a short distance of the tip, when it curves towards the middle line, compressed, keeled and minutely winged on the curved portion, hyaline on the margins, firmer in the dorsal region, covered all over the back with a dense mat of white hairs, more sparsely hairy on the sides, ciliate on the margins. *Lower floret* empty ; *lemma* a hyaline scale, oblanceolate-acute in shape, 3 mm. long ; *palea* absent. *Upper floret* ♀ ; *lemma* elliptic-acute in shape, hyaline, cleft at the tip into two lobes, smooth and glabrous, awned in the sinus, 3 mm. long ; *palea* absent ; *awn* perfect, 8 mm. long ; *column* 2 mm. long, chestnut-coloured, twisted ; *stamens* 2 ; *anthers* 2 mm. long.

Ceylon : Pasdunkorale [Pardooncorli (sic)], Sept. 1864, *Thwaites* 956 pro parte (typus presumably at Peradeniya, duplicate in Herb. Kew.) ; Elpiliya Patana, *Pearson* fide Hook. f.

In Trimen, Handbook of the Flora of Ceylon, Hook. f. remarks, under this species, " it resembles what would be a very large perennial state of *D. pubescens* with woolly leaves and smaller spikelets ". As already pointed out in the introductory remarks, this species, represented by two inflorescences, is pasted on the type sheet of *D. pubescens* Hack. Both are utterly different from one another, and from what Hook. f. considered to be *D. pubescens*. The latter is a small annual plant which has larger spikelets than *D. trimenii*, and has been named *D. ceylanica* Bor.

23. Dimeria gracilis *Nees ex Steud.*, Syn. Pl. Glum. 413 (1855).

D. leptorhachis Hack. subspec. *genuina* Hack. in DC. Monogr. Phan. 6, 89 (1889).

D. pilosissima Thw., Enum. Pl. Zeyl. 369 (1864) non Trin.

D. laxiuscula Thw. et Trim. in Journ. Bot. 23, 272 (1885).

A perennial grass. *Culms* up to 85 cm. tall, somewhat stout, smooth and glabrous even on the nodes, striate, covered at the base with the bases of old sheaths which are hirsute with whitish hairs. *Leaf-blades* linear, narrowed at the base to the sheath, tapering gradually to a very acuminate, stout point, absolutely smooth and glabrous or covered

sparsely with whitish hairs, up to 25 cm. long, 7–8 mm. wide, usually flat, sometimes plicate, ascending not spreading ; *sheaths* tight, close, over-lapping, smooth and glabrous except those at the base which are covered below with a covering of stiff whitish hairs, covering the nodes ; *ligule* very short, membranous, lacerate.

Inflorescence of a number (3–11) of racemes seated on a long-exserted, glabrous peduncle ; racemes up to 12 cm. long, usually much less, consisting of a filiform, tough rhachis bearing pedicelled spikelets, one to a node ; nodes of the raceme about half the length of the spikelets ; pedicels clavate, 2·75 mm. long, ciliate along the outer margin with hairs up to 2 mm. long, ciliate on the margin of the oblique articulation above ; rhachis tough, glabrous. *Spikelets* (4) 5·5 to 6 mm. long, including a callus 0·5 mm. long, gaping at the mouth ; callus bearded with hairs which are longer than itself. *Lower glume* (4) 5 to 5·5 mm. long, 1·2 mm. wide when flattened, chartaceous in texture, thinning out on the margins, oblong-acute with a very short mucro at the tip which is often bent backwards, covered all over the back with long white hairs or almost glabrous ; *upper glume* 5–6 mm. long, 1–1·5 mm. wide, oblong-acute with the tip drawn out into a reflexed mucro, coriaceous in texture becoming thin on the margins, somewhat keeled towards the apex and covered all over the back with fairly long white hairs or scabridities which are often arranged in longitudinal lines corresponding to the nerves or almost glabrous. *Lower floret* empty ; *lemma* hyaline, 1·5–3 mm. long, bearing white hyaline hairs as long as itself on the margins ; *palea* absent ; *upper floret* ♂ ; *lemma* 4 mm. long, cleft at the tip into two acute or obtuse lobes, hyaline, linear-oblong in shape, with a few hairs at the top, awned in the cleft ; *palea* absent or a minute scale ; *awn* 9–10 mm. long, of which 4 mm. are twisted, brown column ; *stamens* 2 ; *anthers* 3 mm. long ; *styles* 2, *stigmas* plumose, purple ; *lodicules* 2, small, cuneate.

Ind. Or. : Concan, Woodrow ; Sirsi, Apr. 1939, *N. L. Bor* s.n.

Ceylon : Adam's Peak, *Thwaites* C.P. 24, 3261 ; Baddegama Galle, 4 Jan. 1927, *A. H. G. Alston* 438—in wet open places ; Pasdoon Korle, *Thwaites* C.P. 3863 (Type of D. laxiuscula Thw.) ; *Macrae* 229 (type of *D. gracilis* Nees ex Steud. in Herb. J. Lindley, Cambridge).

The type of *Dimeria gracilis* Nees is in the Lindley Herbarium at Cambridge and was obtained by the courtesy of the Professor of Botany. It is represented by the base of a perennial grass from which issue several weak culms carrying poor inflorescences of short weak racemes. One gains the impression that these inflorescences were gathered late in the season when perennial tropical grasses often send out a few additional culms after the main flowering. These inflorescences are never representative, being usually weak, but there is little difference in the spikelets of such inflorescences and those of the normal plant. The type sheet can be matched with several sheets collected by Alston in Ceylon in the month of January. These sheets bear out the impression outlined above. The inflorescences are few-racemed and the racemes themselves short and weak.

The two species *D. laxiuscula* and *D. leptorhachis* must, I think, be relegated to *D. gracilis* for, except for length of raceme, number of racemes,

and in the much more copious indumentum of the spikelets, there are no differences of specific significance. Vegetatively they are all exactly similar.

24. Dimeria velutina *Bor* in Kew Bull. **1951,** 458 (1952).

D. leptorhachis Hack. subspec. *velutina* Hack. in DC. Monogr. Phan. 6, 90 (1889).

A perennial grass, erect or slightly decumbent at the base, hirsute on the basal sheaths. *Culms* up to 60 cm. tall, covered with overlapping sheaths in the lower half, smooth and glabrous, terete, striate, upper half bare and exserted from the uppermost leaf sheath. *Leaf-blades* up to 20 cm. long by 12 mm. broad, linear-acuminate, long tapering to a very slender but stout point, covered on both surfaces with an exceedingly thick coat of fine, white hairs arising mostly from rather small tubercle-bases, on the lower surface these hairs stand out at right angles to the midrib of the blade, smooth or most minutely scaberulous on the cartilaginous margins, mostly erect and not spreading ; *leaf-sheaths* tight, the older breaking away from the culm, striate on the back and sides, covered all over with a very dense, close, hairy covering of fine white hairs from tubercle-bases ; *ligule* membranaceous, convex upward, glabrous, 1–2mm. long.

Inflorescence of 4–5 racemes up to 16 cm. long, consisting of a tough, filiform, glabrous rhachis with nodes 4–5 mm. long and spikelets seated on short glabrous pedicels at each node ; pedicels clavate, glabrous, 0·5 mm. long. Spikelets 6–7 mm. long (with a callus 0·5 mm. long), oblong in outline, slightly gaping ; callus 0·5 mm. long, smooth and glabrous, but bearded on the lower margins with hairs which are shorter than the callus ; *lower glume* oblong-acute, chartaceous, 6·5 mm. long, 0·75 mm. wide, obscurely nerved, scabrid on the rounded, dorsal surface ; *upper glume* 6·5 mm. long, 1·0 mm. wide, strongly keeled, scabrid on the keel with a few hairs towards the top, scabrid on the sides, scarious on the margins, ciliate on the margins. *Lower floret* empty ; *lemma* a hyaline scale 4 mm. long, 0·5 mm. broad, rather firm along the middle line, ciliate on the margins towards the acute tip ; *upper floret* ♀ ; *lemma* 5 mm. long, 1·0 mm. wide, cleft at the tip into two acute lobes awned in the cleft, smooth and glabrous ; *awn* 12 mm. long, of which half is brown twisted column ; *stamens* 2 ; *anthers* 3·5 mm. long ; *styles* 2, long ; *stigmas* plumose, purple ; *palea* absent or an insignificant, hyaline scale 2 mm. long ; *lodicules* 2, very small, cuneate.

Burma : Tenasserim? *Griffith* 6799 (typus in Herb. Kew.). Tenasserim, *Helfer*.

For a discussion of this species Kew Bulletin 1951, p. 455 may be seen.

25. Dimeria woodrowii *Stapf* in Hook., Icon. Plan. sub tab. 2312 (1895).

An annual grass. *Culms* few to many from the base, with stilt roots from the lowest node, up to 15 cm. tall, erect or very shortly decumbent at the base, simple or much branched, smooth and glabrous, hairy at the nodes, with the internodes shorter than the sheaths. *Leaf-blades* linear-acuminate up to 7 cm. long, 1–3 mm. wide, rather thick, with a very

broad mid-rib, with a few bulbous-based white hairs on the upper surface toward the base, or glabrous, very minutely scabrid on the upper surface, smooth or very minutely scabrid on the margins, tapering to a rather stout point ; *sheaths* very loose, longer than the internodes, smooth and glabrous, striate, hyaline on the margins, spathe-like at the uppermost node, subtending the inflorescence ; *ligule* a ciliate membrane, 1–1·5 mm. long.

Inflorescence consisting of a peduncle enclosed in a spathe-like sheath and articulated to the tip of the uppermost internode, carrying at the tip two racemes each of which consists of a flat, tough rhachis, straight at first, afterwards circinately involute, each forming a hoop with the shortly-pedicelled spikelets coming to rest on the inner surface ; rhachis smooth and glabrous ; pedicels stout, very short, bearded or ciliate at the tip. *Spikelets* rather distant, 3–4 mm. long. *Lower glume* 3 mm. long, including a callus 0·5 mm. long, coriaceous, firmly compressed but rounded on the scabrid keel, oblong obtuse when flattened, straight on the back, glabrous, or with a few hairs on the sides ; *upper glume* without a callus, 3 mm. long, firmly compressed but not keeled on the back, coriaceous, becoming thinner on the margins, oblong-obtuse when flattened, but curved on the back which is scabrid, glabrous, or with a few whitish hairs at the sides, very narrowly winged on the keel at the tip. *Lower floret* empty ; *lemma* a hyaline oblanceolate scale 2–2·5 mm. long. *Upper floret* ♀ ; *lemma* 1·5 mm. long, oblong-acute, very shortly cleft at the tip, with a strong mid-rib continued out as a short stout awn, 2–3 mm. long, which does not appear to be always differentiated into column and bristle, or if so, with a very short, twisted column ; *palea* absent ; *styles* 2, distinct ; *stigmas* plumose; *stamens* 2 ; *anthers* 1 mm. long ; *grain* 2·5 mm. long, compressed lanceolate in outline ; *embryo* half as long as the grain ; *hilum* basal, small ; lodicules 2, very small, truncate, toothed.

Ind. Or. : Bombay State, Karanji, Ratnagiri Dist., Oct. 1892, *Bhiva Babajee* (typus in Herb. Kew.) ; Murmagao, 20 Oct. 1891, *Talbot*. Several localities in the Konkan and North Kanara.

The type sheet, although named in honour of Woodrow, a lecturer at that time in the College of Agriculture, Poona, was collected by Bhiva Babajee, according to a note by Woodrow on a Dehra Dun sheet. The specimens on Talbot's sheet are younger than those on the other and enabled stamens, stigmas and styles to be seen. The anthers and stigmas are thrust out between the margins of the two glumes, half-way up the spikelet.

This species is certainly the strangest and most highly evolved of all the Dimerias. The peduncle, which supports the two racemes, is enclosed in a spathe and is articulated to a short branch which itself arises in the axil of a sheath. This articulation is hairy and appears to be glandular. When the two racemes emerge from the spathe-like sheath they are straight and are pressed together. On emergence of the racemes from the sheath it is not possible to differentiate an upper and lower surface. The alternately arranged pedicels which carry the spikelets are lateral to the axis. As anthesis approaches the two rhachides diverge from one another and at the same time curve inwards, as do the pedicels which carry the spikelets. The peduncle meanwhile begins to move on its joint outwards

and finally downwards so that by the time the inflorescence is mature it is hanging vertically. The curving inwards of the two racemes keeps pace with the movement of the peduncle and at maturity the two racemes are tightly coiled into a hoop so that the spikelets are firmly pressed together. The spikelets do not fall readily from their pedicels, and indeed, in the material at hand, the spikelets have to be separated by force from the pedicels, even in quite mature inflorescences.

Eventually, the peduncle disarticulates at its base, and the inflorescence, consisting of the peduncle and tightly coiled racemes still carrying the spikelets, must fall to the ground. What the final fate of this plexus is must await observation in the field.

This species differs from other species of *Dimeria* in the following respects :—(1) the very tardy disarticulation (if they ever do disarticulate) of the spikelets ; (2) the coiling of the two racemes into a hoop ; (3) the movement of the peduncle and racemes through 180° ; (4) the position of the spikelets relative to the rhachis.

What benefit the extraordinary behaviour of the inflorescence confers upon the plant is impossible to say, only observation of the plant in the field can answer that question.

Addendum

When this paper had reached the page-proof stage, I received the type sheets of *D. kanjirapallilana* and *D. kurumthotticalana*, both described by K. C. Jacob in Journ. Bomb. Nat. Hist. Soc. 47, 49 (1947). With regard to the former, it must be considered when the polymophic *D. ornithopoda* complex is taken up. With regard to the latter species, it is closest to *D. ceylanica* Bor and bears little resemblance to *D. lawsonii*, as Jacob believed. It may well be that *D. ceylanica* will become synonymous with *D. kurumthotticalana* when more is known of the latter. At present the two can be separated as follows :—

D. ceylanica	*D. kurumthotticalana*
Spikelets 1.5 mm. broad	Spikelets 2 mm. broad
Upper glume very narrowly winged just below the apex	Upper glume with a substantial wing half to three-qaurters the length of the glume.
Tip of the upper glume acuminate	Tip of the upper glume acute

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